UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF PREVENTION,
PESTICIDES AND
TOXIC SUBSTANCES

Chemical: Difenoconazole
PC Code: 128847
DP Barcodes: D316708,
D316620, D316707

MEMORANDUM

DATE: 21 September 2005

SUBJECT: Section 3 request for uses of difenoconazole on seed (seed treatment) for barley, sweet corn, and cotton

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TO: John Bazuin, Risk Manager Reviewer
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Attached please find the Environmental Fate and Effects Division's (EFED) environmental risk assessment for the proposed registration of difenoconazole as a fungicide on barley, sweet corn, and cotton seed. There are two end-use products proposed under these actions: Dividend Extreme (Reg. No. 100-1141) and Dividend XL RTA (Reg. No. 100-826). Assuming maximum seeding rates, the proposed applications rates are 0.008, 0.006, and 0.024 lbs ai/acre for sweet corn, cotton, and barley, respectively. Both products are co-formulated with mefanoxam (PCcode 113502); risks associated with mefanoxam are not addressed in this assessment.

Key findings of this risk assessment are as follows:

- EFED's screening level assessment suggests that the greatest concerns for difenoconazole ecological risks lie with chronic effects in birds and mammals. These risks to birds and mammals are a concern for non-endangered and endangered species that forage on seeds. Based on chronic exceedences and acute risk for birds and mammals there may be potential indirect effects to species of concern that depend on the affected birds and

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mammals as a source of food.

- The results of this risk assessment suggest that the patterns of difenoconazole use for barley, sweet corn, and cotton are such that they coincide in time and space to areas frequented by avian and mammalian wildlife. These areas have been of demonstrated use by wildlife as sources of food and cover. The potentially problematic wildlife food items (treated seeds) suggested by this risk assessment are likely to be present in and around the treated areas. There is a potential for adverse direct and indirect effects to birds and mammals.

- Listed granivorous birds and listed granivorous or omnivorous mammals that were identified as residing in counties where barley, sweet corn, or cotton are grown are listed below:
  Birds: Masked Bobwhite (*Colinus virginianus ridgwayi*), San Clemente Sage Sparrow *(Amphispiza belli clementeae)*, Florida Shrub Jay *(Aphelocoma coerulescens coerulescens)*, Cape Sable Seaside Sparrow *(Ammodramus maritimus mirabilis)*, Florida Grasshopper Sparrow *(Ammodramus savannarum floridanus)*,Florida Grasshopper Sparrow *(Ammodramus savannarum floridanus)*, Hawaiian coot *(Fulica americana alai)*, Hawaiian duck *(Anas wyvilliana*), Laysan finch *(Telespyza cantans)*, Nihoa finch *(Telespyza ultima)*, Hawaiian goose *(Branta (=Nesochen) sandvicensis)*, Hawaiian common moorhen *(Gallinula chloropus sandvicensis)*, Mississippi sandhill crane *(Grus canadensis pulla)*, and Attwater's Greater Prairie Chicken (*Tympanuchus cupido attwateri*).
  Mammals: Alabama Beach Mouse *(peromyscus polionotus ammobates)*, Perdido Key Beach Mouse *(peromyscus polionotus trissyllepsis)*, Fresno Kangaroo Rat (*Dipodomys nitratoides exilis*), Giant Kangaroo Rat (*Dipodomys ingens*), San Bernardino Kangaroo Rat (*Dipodomys merriami parvus*), Morro Bay Kangaroo Rat (*Dipodomys heermanni morroensis*), Stephens Kangaroo Rat (*Dipodomys stephensi*), Tipton Kangaroo Rat (*Dipodomys nitratoides nitratoides*), Pacific Pocket Mouse (*Perognathus longimembris pacificus*), Amargosa Vole *(Microtus montanus nevadensis*), Preble's Meadow Jumping Mouse *(Zapus hudsonius preblei)*, Delmarva Peninsula Fox Squirrel *(Sciurus niger cinereus)*, Anastasia island beach mouse *(Peromyscus polionotus phasma)*, Choctawhatchee beach mouse *(Peromyscus polionotus allophrys*), Southeastern beach mouse *(Peromyscus polionotus niveiventris)*, Grizzly bear *(Ursus arctos horribilis)*, Northern Idaho Ground Squirrel *(Spermophilus brunneus brunneus)*, American black bear *(Ursus americanus)*, Louisiana black bear *(Ursus americanus luteolus)*, Carolina Northern Flying Squirrel *(Glaucomys sabrinus coloratus)*, Columbian white-tailed deer *(Odocoileus virginianus leucurus)*, and Virginia Northern Flying Squirrel *(Glaucomys sabrinus fuscus).*
  With additional refinement by exploring more detailed species biology (e.g., geographic location, specific feeding habits, time of year likely to utilize crop fields), some species listed above may be determined to be "not likely to be affected".

- No acute or chronic risks of concern were identified for freshwater or estuarine/ marine fish and invertebrates. Risks are not likely for pollinators and beneficial insects, based on toxicity studies on bees. Risks to aquatic and terrestrial plants could not be evaluated due to lack of toxicity data.

Key uncertainties and information gaps are as follows:

- Metabolites and degradates of difenoconazole are not considered in this assessment however, they will be addressed in a separate document. For this action, EFED considered risk only from parent difenoconazole. Potential additional risk from difenoconazole degradates and the combined risk from other pesticide chemicals in the same chemical class and their degradates is to be a separate, future OPP action.

- A soil photolysis study (Guideline 161-3, OPPTS 835.241) is requested. Both the natural and artificial sunlight studies that were submitted (MRID 422451-30) were not scientifically valid and did not provide useful information on the photodegredation of difenconazole on sandy loam soil. Since soil degradation, aquatic degradation and degradation by hydrolyis is slow, but degradation by aqueous photolysis is relatively fast, soil photolysis may be an important route of degradation. Understanding this route would provide a better characterization of the fate of difenconazole in the environment, especially of its availability for runoff into water bodies.

- Chronic estuarine/marine fish and invertebrate studies were not provided for this risk assessment. The toxicity values for these species were estimated based on freshwater acute to chronic ratios. These studies will be requested if additional uses are proposed that have higher application rates.

- This risk assessment does not estimate risk for sediment dwelling organisms because a toxicity study was not provided. Because difenoconazole is persistent and has a high Koc, concentrations in sediment are expected to be higher than those present in the water column. A study determining the toxicity of difenoconazole residues to benthic organisms is requested.

- Terrestrial and aquatic plant studies were not available for this risk assessment. Aquatic plant studies for the suite of five species will be required if additional uses are proposed that have higher application rates and/or greater potential for exposure. Terrestrial plant data will be requested if additional uses are proposed that have higher application rates and/or have greater potential for exposure. In addition, if any non-seed treatment uses are proposed for difenoconazole, terrestrial plant data will be required.

SECTION 3 NEW USE

ENVIRONMENTAL FATE AND EFFECTS SCIENCE CHAPTER

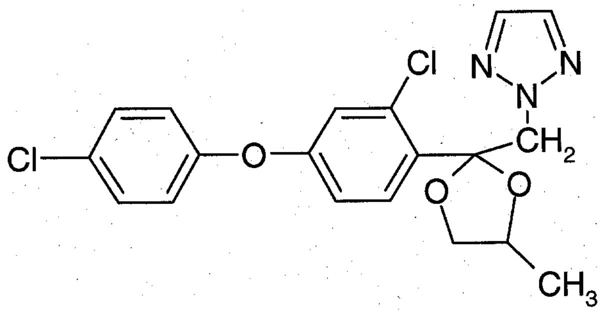
Environmental Fate and Ecological Risk Assessment

For

Difenoconazole (PC 128847)
1-{2-[4-(chlorophenoxy)-2-chlorophenyl-(4-methyl -1,3-dioxolan-2-yl)-methyl]}
-1H-1,2,4-triazole

and End Use Product:

Dividend Extreme 100-1141 (7.73% difenoconazole)
Dividend XL RTA 100-826 (3.21% difenoconazole)



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ASSOCIATED DP BARCODES: D316708, D316620, D316707

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I. EXECUTIVE SUMMARY

A. Nature of Chemical Stressor

Difenoconazole is fungicide for use as a seed treatment to suppress seed-borne diseases, early season damping-off, and fall foliar diseases (first 6 weeks after planting). The proposed labels evaluated in this risk assessment are Dividend Extreme (100-1141) for barley, sweet corn, and cotton and Dividend XL RTA (100-826) for barley. Assuming maximum seeding rates, the proposed applications rates are 0.008, 0.006, and 0.024 lbs ai/acre for sweet corn, cotton, and barley, respectively.

The end use products, Dividend Extreme and Dividend XL RTA, contain a second active ingredient, mefenoxam. Any risks related to mefenoxam have not been evaluated in this risk assessment.

B. Potential Risk to Non-target Organisms

The results of the risk assessment suggest the potential for chronic effects to endangered and non- endangered birds and mammals that forage on seeds. Specifically, Risk Quotient (RQ) values for those taxonomic groups exceed Levels of Concern (LOCs) established by the Agency for the screening-level risk assessment. Based on the potential for chronic effects for birds and mammals, there may be potential indirect effects to species of concern that depend on the affected birds and mammals as a source of food.

The results of this risk assessment suggest that the patterns of difenoconazole use for barley, sweet corn, and cotton are such that they could potentially coincide in time and space to areas frequented by avian and mammalian wildlife. These areas have been of demonstrated use by wildlife as sources of food and cover. The potentially problematic wildlife food items (treated seeds) suggested by this risk assessment are likely to be present in and around the treated areas. There is a potential for adverse direct and indirect effects to birds and mammals.

Listed granivorous birds and listed granivorous or omnivorous mammals that were identified as residing in counties where barley, sweet corn, or cotton are grown are listed below:

Birds: Masked Bobwhite (*Colinus virginianus ridgwayi*), San Clemente Sage Sparrow *(Amphispiza belli clementeae)*, Florida Shrub Jay *(Aphelocoma coerulescens coerulescens)*, Cape Sable Seaside Sparrow *(Ammodramus maritimus mirabilis)*, Florida Grasshopper Sparrow *(Ammodramus savannarum floridanus)*,Florida Grasshopper Sparrow *(Ammodramus savannarum floridanus)*, Hawaiian coot *(Fulica americana alai)*, Hawaiian duck *(Anas wyvilliana)*, Laysan finch *(Telespyza cantans)*, Nihoa finch *(Telespyza ultima)*, Hawaiian goose *(Branta (=Nesochen) sandvicensis)*, Hawaiian common moorhen *(Gallinula chloropus sandvicensis)*, Mississippi sandhill crane *(Grus canadensis pulla)*, and Attwater's Greater Prairie Chicken (*Tympanuchus cupido* *attwateri*).

Mammals: Alabama Beach Mouse *(peromyscus polionotus ammobates)*, Perdido Key Beach Mouse *(peromyscus polionotus trissyllepsis)*, Fresno Kangaroo Rat (*Dipodomys nitratoides exilis*), Giant Kangaroo Rat (*Dipodomys ingens*), San Bernardino Kangaroo Rat (*Dipodomys merriami parvus*), Morro Bay Kangaroo Rat (*Dipodomys heermanni morroensis*), Stephens Kangaroo Rat (*Dipodomys stephensi*), Tipton Kangaroo Rat (*Dipodomys nitratoides nitratoides*), Pacific Pocket Mouse (*Perognathus longimembris pacificus*), Amargosa Vole *(Microtus montanus nevadensis*), Preble's Meadow Jumping Mouse *(Zapus hudsonius preblei)*, Delmarva Peninsula Fox Squirrel *(Sciurus niger cinereus)*, Anastasia island beach mouse *(Peromyscus polionotus phasma)*, Choctawhatchee beach mouse *(Peromyscus polionotus allophrys*), Southeastern beach mouse *(Peromyscus polionotus niveiventris)*, Grizzly bear *(Ursus arctos horribilis)*, Northern Idaho Ground Squirrel *(Spermophilus brunneus brunneus)*, American black bear *(Ursus americanus)*, Louisiana black bear *(Ursus americanus luteolus)*, Carolina Northern Flying Squirrel *(Glaucomys sabrinus coloratus)*, Columbian white-tailed deer *(Odocoileus virginianus leucurus)*, and Virginia Northern Flying Squirrel *(Glaucomys sabrinus fuscus)*.

With additional refinement by exploring more detailed species biology (e.g., geographic location, specific feeding habits, time of year likely to utilize crop fields), some species listed above may be determined to be "not likely to be affected".

No acute or chronic risks of concern were identified for freshwater or estuarine/marine fish and invertebrates. Risks are not likely for pollinators and beneficial insects based on a honey bee acute contact toxicity study. Risks to aquatic and terrestrial plants could not be evaluated due to lack of toxicity data.

C. Conclusions - Exposure Characterization

Environmental fate and transport data indicate that difenoconazole is persistent (laboratory and field half-lives (t1/2) ranged from 93 days to over 1 year) in the soil environment. The overall stability of the compound suggests that difenoconazole will tend to accumulate in the soil with successive application year to year. Difenoconazole used as a seed treatment for barley, sweet corn, and cotton has potential to reach surface water via entrainment on eroded sediment, but is less likely to reach ground water.

D. Conclusions - Effects Characterization

Difenoconazole is highly toxic to freshwater (LC_{50} = 810 μg ai/L) and estuarine/marine (LC_{50} = 819 μg ai/L) fish. Chronic growth effects were observed in freshwater fish (NOAEC = 8.7 μg ai/L). The pesticide is highly toxic to freshwater invertebrates (LC_{50} =770 μg ai/L), estuarine/marine oysters (EC_{50} > 300 μg ai/L), and other estuarine/marine invertebrates (LC_{50} = 150 μg ai/L). Reproductive chronic effects were observed for freshwater invertebrates (NOAEC

= 5.6 μg ai/L). Chronic toxicity studies were not available for estuarine/marine fish and mysids; NOAECs were estimated to be 8.8 and 1.1 μg ai/L, respectively, based on acute-to-chronic ratios of freshwater fish toxicity and to invertebrate toxicity.

Difenoconazole is practically non-toxic to honeybees on an acute contact basis (LD_{50} > 100 μg ai/bee). Difenoconazole is slightly toxic to mammals on an oral acute basis (LD_{50} = 1453 mg/kg bw). The chemical is practically non-toxic to birds on an acute oral basis (LD_{50}> 2150 mg/kg bw). It is practically non-toxic to the mallard duck (LC_{50} > 5000 mg/kg diet) and slightly toxic to the bobwhite quail (LC_{50} = 4760 mg/kg diet) on a subacute dietary basis. Reproductive chronic effects were observed in birds (NOAEC = 125 mg ai/kg-diet) and mammals (NOAEC 25 mg ai/kg-diet). Toxicity to terrestrial and aquatic plants was not evaluated as no data were submitted to the Agency.

E. Key Uncertainties and Information Gaps

The following uncertainties and information gaps were identified as part of the problem formulation:

- Metabolites and degradates of difenoconazole are not considered in this assessment however, they will be addressed in a separate document. For this action, EFED considered risk only from parent difenoconazole. Evaluation of potential additional risk from difenoconazole degradates and the combined risk from other pesticide chemicals in the same chemical class and their degradates is to be a separate, future OPP action.

- A soil photolysis study (Guideline 161-3, OPPTS 835.241) is requested. Both the natural and artificial sunlight studies that were submitted (MRID 422451-30) were not scientifically valid and did not provide useful information on the photodegredation of difenoconazole on sandy loam soil. Since soil degradation, aquatic degradation and degradation by hydrolyis are slow, but degradation by aqueous photolysis is relatively fast, soil photolysis may be an important route of degradation. Understanding this route would provide a better characterization of the fate of difenoconazole in the environment, especially of its availability for runoff into water bodies.

- Chronic estuarine/marine fish and invertebrate toxicity studies were not provided for this risk assessment. The toxicity values for these species were estimated based on freshwater acute to chronic ratios. These studies will be requested if additional uses are proposed that have higher application rates and/or greater potential for exposure.

- Terrestrial and aquatic plant studies were not available for this risk assessment. Fungicides may be toxic to certain aquatic plants and hence aquatic plant data are needed even though the potential for aquatic exposure from seed treatment use is minimal. Aquatic plant studies for the suite of five species are required if additional uses are to be proposed that have higher application rates and/or greater potential for exposure.

Terrestrial plant data will be requested if additional uses are proposed that have higher application rates and/or have greater potential for exposure. In addition, if any non-seed treatment uses are to be proposed for difenoconazole, terrestrial plant data are required.

- Inhalation and dermal exposure routes for terrestrial mammals and birds were not evaluated because these routes of exposure are considered to be negligible compared to the dietary ingestion pathways. Uncertainties associated with exposure pathways for terrestrial animals are discussed in greater detail in Section IV.D.3 of this document.

- Surrogates were used to predict potential risks for species for which no effects data were available. In addition, data for fish and birds were used as surrogates for taxa for which data were not available (i.e., reptiles and amphibians). It was assumed that use of surrogate effects data is sufficiently conservative to apply to the broad range of species within taxonomic groups. If other species are more or less sensitive to difenoconazole than the surrogates, risks may be under or overestimated, respectively.

II. PROBLEM FORMULATION

A. Stressor Source and Distribution

1. Chemical and Physical Properties

Common Name:	Difenoconazole
Synonyms:	Dividend, Dividend Extreme, Dividend XL RTA
Chemical Name (CAS):	1-{2-[4-(chlorophenoxy)-2-chlorophenyl-(4-methyl -1,3-dioxolan-2-yl)-methyl]} -1H-1,2,4-triazole
CAS Registry No.	119446-68-3
PC Code:	128847
Molecular Formula:	$C_{19}H_{17}Cl_2N_3O_3$
Molecular Weight:	406.27
Physical State:	Red Liquid
Vapor Pressure (@ 25 °C):	3.32E-05 mPA @ 25 °C
Specific Gravity/ Density:	1.14g/cm^3 @ 25 °C
Solubility in water (@ 25 °C):	15.0 mg/L @ 25 °C

2. Mode of Action

Difenoconazole is a fungicide in the conazole chemical class. Fungicidal activity of the conazole class of compounds is attributed to the inhibition of ergosterol biosysthesis (www. centerwatch.com /patient/drugs/dru784.html). Ergosterol is a critical component in fungal cell membranes which controls cell membrane permeability (www.hull.ac.uk/php/chsanb/fungweb/fungweb7.htm). The mechanism of controlling ergosterol biosysthesis is through the disruption of the fungal cyctochrome P-450-mediated 14 a-lanosterol demethylation. Accumulation of 14 α-methyl sterols correlates with the subsequent loss of ergosterol in the fungal cell wall.

3. Use Characterization

Difenoconazole is a seed treatment fungicide for controlling soilborne and seedborne pathogens of crop plants. It also controls fall foliar fungal diseases as a seed treatment. The end-use products for difenoconazole examined in this risk assessment are Dividend Extreme (7.73% difenoconazole) and Dividend XL RTA (3.21% difenoconazole). It is applied to the seed as a water based slurry (both formulations) or mist type seed treatment (Dividend XL RTA only) prior to planting. The new use crops proposed for inclusion on the labels are: sweet corn, barley and cotton (Dividend Extreme) and barley (Dividend XL RTA). Recommended application rates range from 1 to 4 fl oz Dividend Extreme/100 lbs seed and from 5 to 10 fl oz. Dividend XL RTA / 100 lb seed. An estimated application rate of lbs ai/acre can be calculated from the labeled rates of fl oz product/hundred-weight seed with the following formula:

$$\frac{lbs\,ai}{acre} = \frac{fl\,oz\,product}{CWT} \times \frac{\%\,ai}{100} \times density(lbs/gal) \times \frac{1\,gal}{128\,fl\,oz} \times \frac{CWT}{100\,lbs\,seed} \times seeding\ rate(lbs/acre)$$

where 9.96 lbs/gal and 9.66 lbs/gal are the densities of Dividend Extreme and Dividend XL RTA, respectively, and CWT =hundred-weight seed. The seeding rate varies for each proposed crop (Table 1). Because of variation in maximum seeding rates of the different crops, difenoconazole application rates range from 0.006 lbs ai/acre to 0.024 lbs ai/acre (Table 1).

Table 1. Maximum proposed application rates for Difenoconazole for Sweet Corn, Barley and Cotton.

Crop	End use product and registration number	Max. seeding rate (lb/acre)	Percent ai in formulation	Application Rate (fl oz product /CWT)	Application rate (lbs ai/CWT)	Application rate (lbs ai/acre)
Sweet Corn	Dividend Extreme 100 - 1141	25	7.73	5	0.030	0.008
Cotton	Dividend Extreme 100 - 1141	18	7.73	5.8	0.035	0.006
Barley	Dividend Extreme 100 - 1141	100	7.73	4	0.024	0.024
Barley	Dividend XL RTA 100-826	100	3.21	10	0.024	0.024

B. Assessment Endpoints

Assessment endpoints are defined as "explicit expressions of the actual environmental value that is to be protected." Defining an assessment endpoint involves two steps: 1) identifying the valued attributes of the environment that are considered to be at risk, and 2) operationally defining the assessment endpoint in terms of an ecological entity (i.e., birds or mammals) and its attributes (i.e., survival and reproduction). Therefore, selection of the assessment endpoints is based on valued entities (i.e., ecological receptors), the ecosystems potentially at risk, the migration pathways of pesticides, and the routes by which ecological receptors are exposed to pesticide-related contamination. The selection of clearly defined assessment endpoints is important because they provide direction and boundaries in the risk assessment for addressing risk management issues of concern.

1. Ecosystems Potentially at Risk

Ecosystems potentially at risk are expressed in terms of the selected assessment endpoints. The typical assessment endpoints for screening-level pesticide ecological risks are reduced survival, and reproductive and growth impairment for both aquatic and terrestrial animal species. Aquatic animal species of potential concern include freshwater fish and invertebrates, estuarine/marine fish and invertebrates, and amphibians. Terrestrial animal species of potential concern include birds, mammals, beneficial insects, reptiles, and earthworms. For both aquatic and terrestrial animal species, direct acute and direct chronic exposures are considered. In order to protect threatened and endangered species, all assessment endpoints are measured at the individual level. Although all endpoints are measured at the individual level, they provide insight about risks at higher levels of biological organization (e.g. populations and communities). For example, pesticide effects on individual survivorship have important implications for both population rates of increase and habitat carrying capacity.

The typical assessment endpoints for screening-level pesticide ecological risks are reduced survival and growth impairment for both aquatic and terrestrial plants. Terrestrial and semi-aquatic plants screening assessment endpoints are not included in this assessment due to lack of data. Because this is a fungicidal seed treatment, terrestrial plants are not a potential concern. However, aquatic and terrestrial plant data will be required if additional new uses for difenoconazole are proposed. Due to low EECs, algae and aquatic plant data were not requested for this risk assessment associated with current seed treatment use.

The ecological relevance of selecting the above-mentioned assessment endpoints is as follows: 1) complete exposure pathways exist for these receptors; 2) the receptors may be potentially sensitive to pesticides in affected media and in residues on seeds 3) the receptors could potentially inhabit areas where pesticides are applied, or areas where runoff may impact the sites because suitable habitat is available.

2. Ecological Effects

Each assessment endpoint requires one or more "measures of ecological effect," which are defined as changes in the attributes of an assessment endpoint itself or changes in a surrogate entity or attribute in response to exposure to a pesticide. Ecological measurement endpoints for this screening level risk assessment are based on a suite of registrant-submitted toxicity studies performed on a limited number of organisms in the following broad groupings:

- Birds (Mallard Duck and Bobwhite quail) used as surrogate species for terrestrial-phase amphibians and reptiles,
- Mammals (laboratory rat),
- Freshwater Fish (Bluegill Sunfish and Rainbow Trout) used as a surrogate for aquatic phase amphibians,
- Freshwater invertebrates (water flea),
- Estuarine/marine fish (Sheepshead Minnow),
- Estuarine/marine invertebrates (Eastern Oyster and Mysid Shrimp),

Within each of these very broad taxonomic groups, an acute and chronic endpoint is selected from the available test data, as the data sets allow. Additional ecological effects data were available for other taxa and have been incorporated into the risk characterization as other lines of evidence including acute laboratory contact and oral toxicity on honeybees.

A complete discussion of all toxicity data available for this risk assessment and the resulting measurement endpoints selected for each taxonomic group are included in Section III.B of this document. A summary of the assessment and measurement endpoints selected to characterize potential ecological risks associated with exposure to difenoconazole is provided in Table 2.

Table 2. Summary of Assessment and Measurement Endpoints for Difenoconazole

Assessment Endpoint	Measurement Endpoint
1. Abundance (i.e., survival, reproduction, and growth) of individuals and populations of birds	1a. Mallard duck acute oral LD_{50} 1b. Bobwhite Quail and Mallard Duck dietary LC_{50} 1c. Mallard duck chronic reproduction NOAEC and LOAEC
2. Abundance (i.e., survival, reproduction, and growth) of individuals and populations of mammals	2a. Laboratory rat acute oral LD_{50} 2b. Laboratory rat chronic reproduction NOAEC and LOAEC

Assessment Endpoint	Measurement Endpoint
3. Survival and reproduction of individuals and communities of freshwater fish and invertebrates	3a. Rainbow trout acute LC_{50} 3b. Fathead minnow chronic (early-life) NOAEC and LOAEC 3c. Water flea acute LC_{50} 3d. Water flea chronic (life-cycle) NOAEC and LOAEC
4. Survival and reproduction of individuals and communities of estuarine/marine fish and invertebrates	4a. Sheepshead minnow acute LC_{50} 4b. Estimated chronic NOAEC value for estuarine/marine fish based on the acute-to-chronic ratio for freshwater fish 4c. Eastern oyster and mysid shrimp acute LC_{50} 4d. Estimated NOAEC and LOAEC values for mysids based on the acute-to-chronic ratio for freshwater invertebrates
5. Perpetuation of individuals and populations of non-target terrestrial and semi-aquatic species (crops and non-crop plant species)	N/A
6. Survival of beneficial insect populations	6a. Honeybee acute contact LD_{50}
8. Maintenance and growth of individuals and populations of aquatic plants from standing crop or biomass	N/A

LD_{50} = Lethal dose to 50% of the test population.
NOAEC = No observed adverse effect level.
LOAEC = Lowest observed adverse effect level.
LC_{50} = Lethal concentration to 50% of the test population.
EC_{50}/EC_{25} = Effect concentration to 50%/25% of the test population.

C. Conceptual Model

1. Risk Hypotheses

The Office of Pesticide Programs uses a screening risk hypothesis for its initial risk assessments:

> *The proposed use of difenoconazole on sweet corn, barley, and cotton seed in accordance with the label results in adverse effects on the survival and/or fecundity to non-target terrestrial and/or aquatic animals; and that the proposed use of difenoconazole according to the label results in adverse effects on survival, reproduction, and/or growth to aquatic, semi-aquatic, and terrestrial plants.*

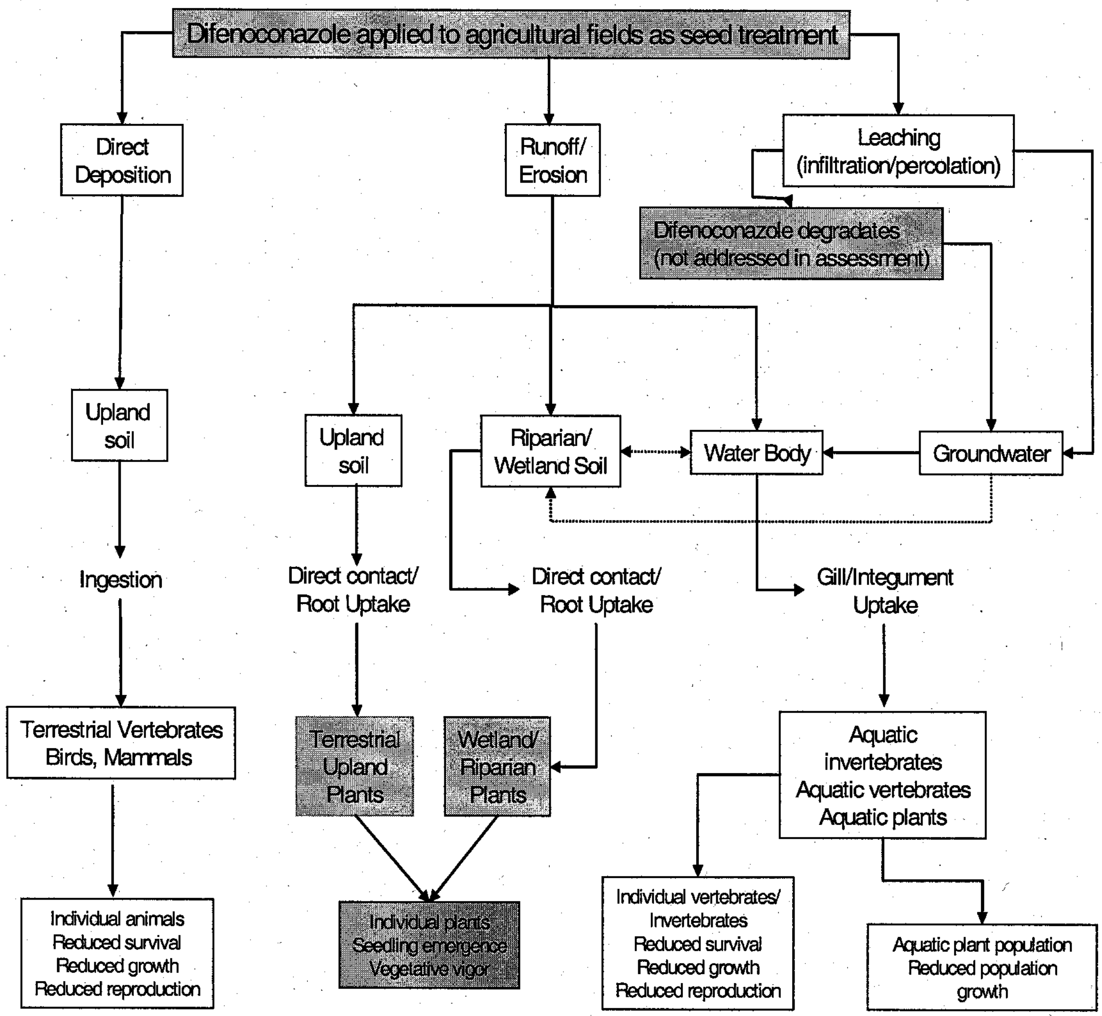
2. Conceptual Model Diagram

In order for a chemical to pose an ecological risk, it must reach ecological receptors in biologically significant concentrations. An exposure pathway is the means by which a contaminant moves in the environment from a source to an ecological receptor. For an ecological exposure pathway to be complete, it must have a source, a release mechanism, an environmental transport medium, a point of exposure for ecological receptors, and a feasible route of exposure. The potential mechanisms of transformation for difenoconazole (i.e., which degradates may form in the environment, in which media, and how much) will be addressed in a separate OPP risk assessment. The assessment of ecological exposure pathways includes an examination of the source and potential migration pathways for constituents, and the determination of potential exposure routes (e.g., ingestion, inhalation, dermal absorption).

Ecological receptors that may potentially be exposed to the parent difenoconazole as a seed treatment include terrestrial and semiaquatic wildlife (i.e., mammals, birds, and reptiles), semi-aquatic plants, and soil invertebrates. In addition to terrestrial ecological receptors, aquatic receptors (e.g., freshwater and estuarine/marine fish and invertebrates, amphibians) may also be exposed to potential migration of pesticides from the site of application to various watersheds and other aquatic environments via runoff.

The source and mechanism of release of difenoconazole are ground application via treated seeds. Surface water runoff from the areas of application is assumed to follow topography. Potential emission of volatile compounds is not considered as a viable release mechanism for difenoconazole, since volatilization is not expected to be a significant route of dissipation for this chemical because of the low vapor pressure of the compound. The conceptual site models shown in Figure 1 generically depict the potential source of difenoconazole, release mechanisms, abiotic receiving media, and biological receptor types. All potential routes of exposure are considered and are presented in the conceptual site model (Figure 1).

Figure 1. Conceptual model depicting ecological risk based on the difenoconazole application to seeds. *



* Note that any potential adverse degradate effects and potential adverse effects of parent difenoconazole on plants (terrestrial and aquatic) are not assessed in this risk assessment.

III. ANALYSIS

A. Exposure Characterization

1. Environmental Fate and Transport Characterization

Based on acceptable and supplemental studies, difenoconazole is stable to hydrolysis at pH 5, 7, and 9. Difenoconazole is relatively stable to both aerobic and anaerobic soil metabolism. The calculated half-lives for parent difenoconazole in aerobic and anaerobic loam soil systems were 1600 days and 947 days, respectively. When applied at 0.1 ppm in an aerobic environment in loam soil, difenoconazole is stable. Difenoconazole photodegraded in water with a half-life of 6 days in sterilized pH 7 aqueous buffer solution. Leaching and adsorption/desorption studies indicate that difenoconazole is immobile in soil. Freundlich K_{ads} values were 12.8 for sand soil, 63.0 for sandy loam soil, 54.8 for silt loam soil, and 47.2 for silty clay loam soil. The corresponding K_{oc} values were 3867, 3518, 3471, and 7734 mL/g. Difenoconazole accumulated rapidly in edible and non-edible bluegill sunfish tissues with bioconcentration factors of 170x for edible tissues, 570x for nonedible tissues, and 330x for whole body. Depuration was also rapid with a depuration half-life of approximately 1 day and 96-98% clearance after 14 days of depuration.

Table 3 summarizes the environmental fate data of the parent difenoconazole. Difenoconazole degradate (triazole) will be addressed in a separate OPP action for triazole compounds. Detailed information regarding the environmental fate studies cited in this report can be found in Appendix B.

Table 3. Summary of Environmental Fate Properties of Difenoconazole

Study	Half-lives, Days	MRID	Study Status
Hydrolysis	stable at pH = 5, 7, and 9	42245127	Core
Direct Aqueous Photolysis	6 days at pH = 7	42245128	Supplemental
Soil Photolysis	not available		
Aerobic Soil Metabolism	stable 1600 at 10 PPM (study conducted under atypical conditions)	42245131 42245132	Supplemental Supplemental
Anaerobic Soil Metabolism	947 at 10 PPM (No anaerobic studies at 0.1PPM)	42245132	Supplemental
Anaerobic Aquatic Metabolism	stable	42245134	Supplemental
Aerobic Aquatic Metabolism	stable	42245134	Supplemental

Study	Half-lives, Days	MRID	Study Status
Leaching and Adsorption Desorption, Koc	3867, sand 3518, sandy loam 3471, silt loam 7734, silty clay loam	42245135	Supplemental

2. Aquatic Resource Exposure Assessment

No ground or surface water monitoring data are available for difenoconazole. Therefore, exposure concentrations for aquatic ecosystems assessments were estimated based on EFED's Tier I GENEEC aquatic exposure model for surface water Version 2.0 (August 1, 2001). The input parameters used in this assessment were selected from the environmental fate data submitted by the registrant and in accordance with US EPA-OPP EFED water model parameter selection guidelines, Guidance for Selecting Input Parameters in Modeling the Environmental Fate and Transport of Pesticides, Version II, February 28, 2002. Additional information on GENEEC and other water models can be found at: http://www.epa.gov/oppefed1/models/water/index.htm.

The seed treatments modeled for this risk assessment for difenoconazole are corn, barley and cotton. Input parameters and results are tabulated in Tables 4 and 5, and the GENEEC output is provided in Appendix B.

Table 4: GENEECv2.0 Input Parameters for Difenoconazole

	SOURCE	VALUE*
Application rates	Labels (Reg. 100-1141 and 100-826)	0.008 lbs ai/acre (sweet corn) 0.006 lbs ai/acre (cotton) 0.024 lbs ai/acre (barley)
Number of Applications	Label (Reg. 100-740)	1
Application Method, incorporation	Model Option	Granular, 1 inch incorporation depth
Koc	MRID 42245135	3471 (lowest non-sand soil Freundlich sorption coefficient normalized for organic carbon)
Solubility	Material Safety Data Sheet (A-8574A)	15 mg/L @ 25°C
Photodegradation in Water Half-life	MRID 42245128	6 days
Aerobic soil metabolism half-life *	MRID 42245131	stable

	SOURCE	VALUE*
Aerobic Aquatic Metabolism Half-life *	MRID 42245134	stable
Hydrolysis at pH=7	MRID 42245127	stable

*Values based on EFED input parameter guidance (USEPA 2002).

Table 6. Difenoconazole EECs in Surface Water for Use in Ecological Risk Assessment

Crop	Label Numbers	Maximum App. Rate		Number of Apps.	Peak Conc. ($\mu g/l$)	average 21 day Conc. ($\mu g/l$)	Average 60 day Conc. ($\mu g/l$)
		lbs seed/acre	lbs ai/acre				
Sweet Corn	100-1141	25	0.008	1	0.067	0.061	0.052
Cotton	100-1141	18	0.006	1	0.050	0.046	0.039
Barley	100 - 826 100-1141	100	0.024	1	0.201	0.184	0.157

3. Terrestrial Organism Exposure Modeling

Terrestrial wildlife exposure estimates are typically calculated for bird and mammals, emphasizing a dietary exposure route for uptake of pesticide active ingredients. These exposures are considered as surrogates for terrestrial-phase amphibians as well as reptiles. For exposure to terrestrial organisms, such as birds and small mammals, pesticide residues on food items are estimated, based on the assumption that organisms are exposed to a single pesticide residue in a given exposure scenario. The application method for all proposed uses of difenoconazole is seed treatment. For this terrestrial exposure assessment, seed treatment applications of difenoconazole to corn, barley and cotton are considered.

Birds and mammals in the field may be exposed to seed treated with pesticides by ingesting material directly with the diet. They also may be exposed by other routes, such as incidental ingestion of contaminated soil, dermal contact with treated seed surfaces and soil during activities in the treated areas, preening activities, and ingestion of drinking water contaminated with pesticide. Only ingestion of treated seed was considered as a route of exposure in this assessment.

Terrestrial EECs and acute risk quotient values were calculated using the T-REX Model version 1.1. This model assesses dietary consumption in two different ways for the purposes of assessing the risk from difenoconazole-treated seeds. The first approach estimates a dietary dose assuming that an organism has been eating only treated seed. This approach uses the acute oral toxicity for the toxicity endpoint (LD_{50}). The second method also uses the acute oral dose for toxicity (LD_{50}), but compares it to the available concentration of pesticide on the basis of pesticide applied per square foot. The approaches have been detailed below using the highest application rate (barley at 0.241 lbs ai/acre), but exposure was also estimated using application rates for the other proposed crops.

Acute Avian Exposure, Method 1(DOSE-BASED)

The first method of assessing exposure to treated seeds was used to assess risk to the smallest seed-eating birds, which weigh about 20 g. Small birds tend to eat more per unit body weight; therefore, they are likely to be the most vulnerable. Exposure is estimated from the concentration of difenoconazole on treated seed. The maximum application rate (0.0241 lbs a.i./acre for 100 lbs barley seed/acre) is equivalent to 241 mg a.i. kg^{-1} of seed. Using daily food intake, as estimated using the allometric equation in EPA (1993), a 20-g bird will consume approximately 5.1 g of food (wet weight) per day:

$$F = \frac{0.648 * BW^{0.651}}{(1 - W)}$$

where F is the food intake in grams of fresh weight per day, BW is the body mass (wet weight, kg) of the organism, and W is the mass fraction of water in the food. For this assessment W is assumed to be 0.1 for seeds. This results in a dose of difenoconazole of 1.23 mg a.i./day (5.1 g seed day^{-1}* 0.001 kg g^{-1} * 241 mg a.i. kg^{-1}). In order to convert the units of exposure to mg/kg bwt-day diet, the dose is divided by the weight of the bird in kg (1.23 mg a.i. day^{-1} / 0.02 kg). The resulting EEC is 61 mg ai/kg bwt-day.

Acute Mammal Exposure, Method 1 (DOSE-BASED)

An approach similar to the one detailed for birds (Method 1) was used for estimation of exposure to mammals. The first method of assessing exposure to treated seeds was used to assess risk to the smallest seed-eating mammals, which weigh about 35 g. Exposure is estimated from the concentration of difenoconazole on treated seed. The maximum application rate (0.0241 lbs a.i./acre for 100 lbs barley seed/acre) is equivalent to 241 mg a.i. kg^{-1} of seed. Using daily food intake, as estimated using the allometric equation in EPA (1993), a 35-g mammal will consume approximately 5.1g of food (wet weight) per day:

$$F = \frac{0.621 * BW^{0.564}}{(1 - W)}$$

where F is the food intake in grams of fresh weight per day, BW is the body mass (wet weight, kg) of the organism, and W is the mass fraction of water in the food. For this assessment W is assumed to be 0.1 for seeds. This results in a dose of difenoconazole of 1.23 mg a.i./day (5.1 g seed day^{-1}* 0.001 kg g^{-1} * 241 mg a.i. kg^{-1}). In order to convert the units of exposure to mg/kg bwt-day diet, the dose is divided by the weight of the mammal in kg (1.23 mg a.i. day^{-1} / 0.035 kg). The resulting EEC is 35 mg ai/kg bwt-day.

Acute Avian and Mammal Exposure, Method 2 (LD_{50}/sq ft)

For the second method of assessing risk due to treated seed, it is assumed that 100% of the seed is available for consumption. This assumption is reasonable as the seed is tiny and is generally not planted deeply (<2 inches). Seed can either be planted by drill or broadcast followed by a drag chain. With either method, seeds are likely to be near the surface and generally available to wildlife. In order to derive an estimate of the pesticide exposure per square foot, the maximum application rate (0.0241 lb ai/acre) was converted to mg ai/sq ft. This maximum application rate (25 mg ai/sq ft) was divided by the body weight of smallest birds and mammals that eat seeds (20 and 35 gm, respectively), resulting in EECs of 1.25 mg ai/sqft - kgbwt and 0.71 mg ai/sqft - kgbwt.

Chronic Avian and Mammalian Exposure

Chronic exposure to treated seed is estimated from the concentration of difenoconazole on treated seed. The maximum application rate (0.0241 lbs a.i./acre for 100 lbs barley seed/acre) is equivalent to 241 mg a.i. /kg seed.

B. Ecological Effects Characterization

1. Evaluation of Aquatic and Terrestrial Ecotoxicity Studies

In screening-level ecological risk assessments, effects characterization describes the types of effects a pesticide can produce in an organism or plant. This characterization is based on registrant-submitted studies that describe acute and chronic toxicity effects information for various aquatic and terrestrial animals . Plant studies for this risk assessment were not submitted. Other sources of information, including reviews of the open literature and the Ecological Incident Information System (EIIS), are conducted to further refine the characterization of potential ecological effects.

Appendix E summarizes the results of the registrant-submitted toxicity studies used to characterize effects for this risk assessment. Toxicity testing reported in this section does not represent all species of birds, mammals, or aquatic organisms. Only a few surrogate species for both freshwater fish and birds were used to represent all freshwater fish (2000+) and bird (680+) species in the United States. For mammals, submitted acute studies were limited to the rat. Chronic estuarine/marine fish and invertebrate toxicity studies were not submitted by registrant. Also, OPP guidelines for toxicity testing do not require that reptiles and amphibians be tested. In the absence of toxicity information on reptiles, the risk assessment assumes that avian and reptilian toxicities are similar. In the absence of toxicity information on reptiles, it is assumed that fish and amphibians have similar toxicities.

For acute toxicity, difenoconazole is classified as slightly toxic to birds, non toxic to honeybees and is slightly toxic to mammals. Difenoconazole is moderately to highly toxic to freshwater fish and highly toxic to freshwater invertebrates, estuarine/marine fish and estuarine/marine invertebrates. No aquatic or terrestrial plant studies were submitted by the registrant. Tables 7 and 8 summarize the most sensitive ecological toxicity endpoints for aquatic and terrestrial organisms respectively. Discussions of the effects of difenoconazole on aquatic and terrestrial taxonomic groups are presented below.

Table 7. Summary of Acute and Chronic Aquatic Toxicity Data Using Difenoconazole

Species	Acute Toxicity			Chronic Toxicity	
	96-hr LC_{50} (μg ai/L)	48-hr EC_{50} (μg ai/L)	Acute Toxicity Classification (MRID)	NOAEC / LOAEC (μg ai/L)	Affected Endpoints (MRID)
Rainbow Trout *Oncorhynchus mykiss*	810		highly toxic (42245107)		
Bluegill sunfish *Lepomis macrochirus*	1200		moderately toxic (42245109)		
Fathead minnow *Pimephales promelas*				NOAEC = 8.7 LOAEC = 19.0	larval length at 30 days post hatch (42245115)
Water flea *Daphnia magna*		770	highly toxic (42245110)	NOAEC = 5.6 LOAEC =13.0	number of young/adult/ reproduction day and adult length (42245114)
Sheepshead minnow *Cyprinodon variegatus*	819		highly toxic (42245112)	NOAEC = 8.8*	
Eastern oyster *Crassostrea virginica*		96hr EC_{50} > 300	highly toxic (42245113)		
Mysid shrimp *Americamysis bahia*	150		highly toxic (42245111)	NOAEC = 1.1**	

* A chronic estuarine/marine fish study was not provided. Estimated value is based on the assumption that the estuarine/marine fish acute to chronic ratio is similar to the freshwater fish acute to chronic ratio.

** A chronic estuarine/marine mysid study was not provided. Estimated value is based on the assumption that the estuarine/marine mysid acute to chronic ratio is similar to the freshwater invertebrate acute to chronic ratio.

Table 8. Summary of Acute and Chronic Toxicity Data for Terrestrial Organisms Exposed to Difenoconazole

Species	Acute Toxicity				Chronic Toxicity	
	LD_{50}	Acute Oral Toxicity (MRID)	5-day LC_{50}	Subacute Dietary Toxicity (MRID)	NOAEC / LOAEC	Affected Endpoints (MRID)
Bobwhite quail			4579 mg ai/kg-diet	Slightly toxic (42245103)		
Mallard duck	>2150 mg ai/ kg-bwt	practically non toxic (42245105)			NOAEC = 125 mg ai/kg-diet LOAEC = 625 mg ai/kg-diet	significant egg shell thinning occurred at 625 mg ai/kg-diet; no other treatment related effects were observed in mortality, growth or reproduction (42245106)
Honey bee	>100 μg ai/bee	practically non toxic (42245124)				
Laboratory rat	1453 mg ai/kg-bwt	slightly toxic (42090006)				
Laboratory rat					NOAEC = 25 mg ai/kg-diet LOAEC = 250 mg ai/kg-diet	decreased maternal body weight gain, decreased pup weights at day 21 (42090018)

Acute Toxicity to Freshwater Fish

Toxicity data are available for acute freshwater fish for difenoconazole. Results of acute toxicity tests with freshwater fish are tabulated in Table D1.

Because the LC_{50} values for the species tested range between 810 to1200 μg ai/ L with toxicity tests for rainbow trout and bluegill sunfish respectively, difenoconazole is classified as moderately to highly toxic to freshwater fish on an acute exposure basis. For this risk assessment, the LC_{50} = 810 μg ai/L was used for determination of the freshwater fish Acute RQ. Acute toxicity testing with rainbow trout (MRID 422451-07) and bluegill sunfish (MRID 422451-09) are consistent with Guideline §72-1(a) and §72-1(c) testing requirements and are classified as core.

Chronic Toxicity to Freshwater Fish

A freshwater fish early life stage test using the TGAI was submitted for difenoconazole (MRID 422451-15) using the preferred test species, fathead minnow (Table D-3). Under the conditions of the test the NOAEC was 8.7 and the LOAEC was 19.0 μg ai/L, and the most sensitive biological parameter was larval length at 30 days post hatch. This study was classified as supplemental because the relative standard deviation for fish weight (53%) in one of the control replicates was greater than 40% and therefore unacceptable. In addition, contamination with the test chemical was observed in two control replicates.

Acute Toxicity to Freshwater Invertebrates

Acute toxicity data for difenoconazole using the TGAI are available for the preferred test species, *Daphnia magna* (Table D-2). The 48-hr LC_{50} value for daphnids was 770 μg ai/L (MRID 422451-10). Based on the results of this study, which is scientifically sound and classified as core, difenoconazole is categorized as highly toxic to the daphnid on an acute toxicity basis. Mortality and/or sublethal effects were observed in all treatment groups, but not in the control groups.

Chronic Toxicity to Freshwater Invertebrates

A freshwater aquatic invertebrate life-cycle test using the TGAI was submitted for difenoconazole (MRID 422451-14) using the preferred species, *D. magna* (Table D-4). The respective NOAEC and LOAEC values were 5.6 μg a.i./L and 13.0 μg a.i./L, based on mean measured concentrations. The number of young per adult per reproduction day and adult length were significantly reduced at concentrations greater than or equal to 13 μg ai/L. The study is scientifically sound, consistent with Guideline §72-4(b); however, it is classified as supplemental because daphnid weight was not measured.

Acute Toxicity to Estuarine/Marine Fish

Two estuarine/marine fish acute toxicity tests using the TGAI were submitted for difenoconazole using the preferred test species, sheepshead minnow (MRIDs 422451-12 and 429067-02). Both of these studies were classified as Core. The results of these tests are provided in Table D-1. The 96 hour LC_{50} of 819 μg ai/L classifies difenoconazole highly toxic to sheepshead minnows (MRID 422451-12).

Chronic Toxicity to Estuarine/Marine Fish

No data were available to assess the chronic toxicity of difenoconazole to estuarine/marine fish. The LC_{50}s for estuarine/marine fish were comparable to the LC_{50}s for freshwater fish, suggesting similar acute sensitivity to difenoconazole. In the absence of data, an approach based on the acute to chronic ratio (ACR) from the freshwater fish data was used to estimate a NOAEC for estuarine/marine fish. The most conservative acute value of 819 μg ai/L was used for estuarine/marine fish. The most sensitive LC50 value (810 μg ai/L) and chronic NOAEC value (8.7 μg ai/L) for freshwater fish were used to estimate a fish ACR.. An estimated NOAEC value of 8.8 μg ai/L was derived for estuarine/marine fish based on the assumption that the acute (LC_{50}) to chronic (NOAEC) ratio for estuarine/marine fish (819 μg ai/L : chronic) is the same as freshwater fish (810 μg ai/L : 8.7μg ai/L). Extrapolation from freshwater to estuarine/marine chronic NOAEC values is possible; however, there is uncertainty associated with this assumption because quantifiable taxonomic sensitivity factors between the two broad categories of fish do not exist.

Acute Toxicity to Estuarine/Marine Invertebrates

Acute difenoconazole toxicity data are available for mysid shrimp and the Eastern oyster and are summarized in Table D-2. The 96-hour mysid shrimp LC_{50} is 150 μg ai/L (MRID 422451-11); therefore, difenoconazole is classified as highly toxic to estuarine/marine crustaceans on an acute exposure basis. The acute mysid study is scientifically sound and is classified as core. Difenoconazole is also highly toxic to mollusks, with an $EC_{50} > 300$ μg ai/L (MRID 42245113). This acute mollusk study is scientifically sound is classified as core. For this risk assessment, the LC50 = 150 μg ai/L was used for determination of the estuarine/marine invertebrate Acute RQ.

Chronic Toxicity to Estuarine/Marine Invertebrates

No data were available to assess the chronic toxicity of difenoconazole to estuarine/marine invertebrates. In the absence of data, an approach based on the acute to chronic ratio (ACR) from the freshwater invertebrate data was used to estimate a NOAEC for estuarine/marine invertebrates. The most conservative acute value of 150 μg ai/L was used for estuarine/marine invertebrates. The most sensitive NOAEC value (5.6 μg ai/L) for freshwater invertebrates was based on number of young/adult reproduction day and adult length. An estimated NOAEC value of 1.1 μg ai/L was derived for estuarine/marine invertebrates based on the assumption that the acute (LC_{50}) to chronic (NOAEC) ratio for estuarine/marine invertebrates (819 μg ai/L: chronic) is the same as freshwater invertebrates (810μg ai/L: 8.7μg ai/L). Extrapolation from freshwater to estuarine/marine chronic NOAEC values is possible; however, there is uncertainty associated with this assumption because quantifiable taxonomic sensitivity factors between the two broad categories of fish do not exist.

Toxicity to Aquatic Plants

No data have been submitted to the Agency in which difenoconazole toxicity to aquatic plants is evaluated.

Acute and Subacute Toxicity to Birds

The acute oral LD_{50} in the mallard duck exceeded the highest dose tested (>2150 mg ai/kg-bw, MRID 42245105; Table D-5). There was no mortality during the study. Difenoconazole is classified as practically non-toxic to birds on an acute exposure basis. The study is classified as core.

The results of the dietary studies for the preferred test species, bobwhite quail and mallard duck, are summarized in Table D-5. In the quail dietary study (MRID 42245103), the LC_{50} = 4579 mg ai/kg-diet, which categorizes difenoconazole as slightly toxic to the bobwhite quail on an acute dietary basis. In the mallard dietary study (MRID 42245104), the LC_{50} exceeded the highest test concentration, >5000 mg ai/kg-diet, which categorizes difenoconazole as practically non-toxic to the mallard duck on an acute dietary basis. Both dietary studies are classified as core and are consistent with Guideline §71-2 subacute avian dietary testing requirements.

Chronic Toxicity to Birds

One avian reproduction dietary study, which is summarized in Table D-6, was submitted to the Agency. In the mallard duck study (MRID 42245106), significant egg shell thinning was detected at 625 mg ai/kg-diet; no other reproductive effects were noted. Therefore, the NOAEC was determined to be 125 mg ai/kg-diet and the LOAEC was 625 mg ai/kg-diet. The avian reproduction study is scientifically sound; however, it is classified as supplemental since the statistical analysis for several response variables could not be confirmed. Summary data were provided for each test group on a weekly basis; the raw data were not reported on a per pen basis.

Acute and Chronic Toxicity to Mammals

In most cases, mammalian toxicity data from the Agency's Health Effects Division (HED) are used to approximate toxicity to wild mammals. However, wild mammal toxicity tests may be required on a case-by-case basis, depending on the results of lower tier toxicity studies such as acute and sub-acute testing, intended use pattern, and pertinent environmental fate characteristics. The registrant has not conducted toxicity testing on wild mammal species. For the purposes of this risk assessment, the available mammalian toxicity data on laboratory mammals was used in the absence of toxicity data on mammalian wildlife (Tables D-7 and D-8).

When administered in an oral dose as a gavage to rats, the resulting LD_{50} was 1453 mg ai/kg-bwt (MRID 420900-06).

Chronic effects of difenoconazole were observed in a 2-generation reproduction study with rats (MRID 420900-18) where both the parental and offspring NOAECs were determined to be 25 mg ai/kg-diet and the LOAEC was 250 mg ai/kg-diet. The parental NOAEC was based on decreased maternal body weight gain and the offspring NOAEC was based on decreased pup weights at day 21. These studies are discussed in more detail in the toxicity chapter provided by HED.

Acute Toxicity to Non-target Insects (Honey Bee)

The results of acute contact testing of difenoconazole on the honey bee are summarized in Table D-9. By 48 hours in the contact test, the LD_{50} >100μg a.i./bee (MRID 422451-24). As a result, difenoconazole is categorized as practically non-toxic to honeybees on an acute contact basis.

Toxicity to Non-target Terrestrial Plants

No data have been submitted to the Agency in which difenoconazole toxicity to terrestrial plants is evaluated.

2. Open Literature Review

A review of the open literature is completed to provide additional information on existing toxicity endpoints commonly used in the screening risk assessment, and to provide insight on endpoints not routinely considered in risk quotient calculations, and effects data on specific taxonomic groups (e.g., amphibians, mussels, etc.). No additional effects information was located in the open literature or in the ECOTOX database for difenoconazole.

3. Incident Data Review

A review of the EIIS database for ecological incidents involving difenoconazole was completed on August 12, 2005. There were no difenoconazole incidents in the database.

Incident reports submitted to EPA since approximately 1994 have been tracked by assignment of I #s in an Incident Data System (IDS), microfiched, and then entered to a second database (in EFED), the Ecological Incident Information System (EIIS). An effort has also been made to enter information to EIIS on incident reports received prior to establishment of current databases. Incident reports are often not received in a consistent format (e.g., states and various labs usually have their own formats), may involve multiple incidents involving multiple chemicals in one report, and may report on only part of a given incident investigation (e.g., residues).

It is believed that the EFED database contains reports of only a small portion of plant and animal wildlife incidents that actually occur as a result of pesticide use. Mortality incidents must be seen, reported, investigated, and have had investigation reports submitted to EPA to have the potential to get entered into a database. Incidents often are not seen, especially if the affected organisms are inconspicuous or few people are systematically looking, for example. Some reasons that observed incidents may not be reported to appropriate authorities capable of investigating the incident include: the finder may not know of the importance of reporting incidents, may not know who to call, or may not feel they have the time or desire to call.

IV. RISK CHARACTERIZATION

Risk characterization is the integration of exposure and effects characterization to determine the potential ecological risk from the use of difenoconazole and the likelihood of effects on aquatic life, wildlife, and plants based on varying pesticide-use scenarios. No data, however, are available for plants but will be required for further new uses. The risk characterization provides an estimation and a description of the risk; articulates risk assessment assumptions, limitations, and uncertainties; synthesizes an overall conclusion; and provides the risk managers with information to make regulatory decisions.

A. Risk Estimation - Integration of Exposure and Effects Data

Results of the exposure and toxicity effects data are used to evaluate the likelihood of adverse ecological effects on non-target species. For the assessment of difenoconazole risks, the risk quotient (RQ) method is used to compare exposure and measured toxicity values. Estimated environmental concentrations (EECs) are divided by acute and chronic toxicity values. The RQs are compared to the Agency's levels of concern (LOCs). These LOCs are the Agency's interpretive policy and are used to analyze potential risk to non-target organisms and the need to consider regulatory action. These criteria are used to indicate when a pesticide's use as directed on the label has the potential to cause adverse effects on non-target organisms. Appendix F of this document summarizes the LOCs used in this risk assessment.

1. <u>Non-target Aquatic Animals</u>

Surface water concentrations resulting from difenoconazole application to selected crops were predicted with the GENEEC model. Three crop scenarios were simulated as seed treatments with one application per year: sweet corn, barley and cotton.

Peak EECs were then compared to acute toxicity endpoints to derive acute RQs. The 60-

day EECs were compared to chronic toxicity endpoints (NOAEC values) to derive chronic RQs for fish, and 21-day EECs were compared to chronic toxicity endpoints for invertebrates. Acute and chronic RQs for freshwater and estuarine/marine organisms are summarized in Table 9 and detailed spreadsheets are provided in Appendix F.

For the proposed application rates on sweet corn, cotton and barley, all acute RQs were less than 0.01; therefore, there were no exceedances of the Endangered Species, Restricted Use, or Acute LOCs. All chronic RQs were less than 0.2; therefore, there were no exceedances of the Chronic LOC.

Table 9. Aquatic Organisms predicted risk quotients from a single application of Difenoconazole as Seed Treatment Use on Corn, Barley and Cotton.

CROP	GENEEC values (μg/L)	Freshwater Fish (μg/L)	Freshwater Invert. (μg/L)	Estuarine/ Marine Fish (μg/L)	Estuarine/ Marine Invert. (μg/L)
	Peak Day 21 Day 60	Acute LC_{50} = 810 Chronic NOAEC =8.7	Acute EC_{50}= 770 Chronic NOAEC =5.6	Acute LC_{50}= 819 Chronic NOAEC= 8.8*	Acute LC_{50}= 150 Chronic NOAEC= 1.1*
Sweet Corn 1 x 0.008 lb ai/acre	0.067 0.061 0.052	Acute RQ <0.01 Chronic RQ<0.01	Acute RQ <0.01 Chronic RQ<0.01	Acute RQ <0.01 Chronic RQ<0.01	Acute RQ <0.01 Chronic RQ=0.03
Cotton 1 x 0.006 lb ai/acre	0.050 0.046 0.039	Acute RQ <0.01 Chronic RQ<0.01	Acute RQ <0.01 Chronic RQ<0.01	Acute RQ <0.01 Chronic RQ<0.01	Acute RQ <0.01 Chronic RQ=0.04
Barley 1 x 0.024 lb ai/acre	0.201 0.184 0.157	Acute RQ <0.01 Chronic RQ=0.02	Acute RQ <0.01 Chronic RQ=.03	Acute RQ <0.01 Chronic RQ=0.02	Acute RQ <0.01 Chronic RQ=0.17

* No study was provided for the chronic toxicity of difenoconazole to estuarine/marine fish or invertebrates. An estimated NOAEC value of 8.8 μg/L was derived for the estuarine/marine based on the assumption that the acute to chronic adult mortality NOAEC ratio for freshwater fish the same as estuarine/marine fish. An estimated NOAEC value of 1.1 μg/L was derived for the estuarine/marine invertebrate based on the assumption that the acute to chronic adult mortality NOAEC ratio for freshwater is the same as estuarine/marine invertebrates.

2. Non-target Terrestrial Animals

The EEC values for terrestrial exposure were based on the labeled application rate as described in Section III.B. of this document. Risk quotients are based on the most sensitive LD_{50} (acute oral toxicity study) and NOAEC (chronic toxicity study) for birds and mammals and are calculated by dividing the EEC by the appropriate toxicity endpoint.

Extrapolations from one organism to another in the same class need to consider differences in the scaling of toxicity for differences in body weight. The LD_{50} for birds can be adjusted for body weight based on the formula recommended by Mineau et al. 1996:

$$\text{Adj.LD}_{50} = \text{LD}_{50}\left(\frac{AW}{TW}\right)^{(a-1)}$$

where adjusted LD_{50} is the median 50% lethal dose for the species being assessed, LD_{50} is the median lethal dose in the test organism, AW is the body weight of the assessed organism, TW is the body weight for the test organism, and *a* is the slope of the regression line for estimating the assessed species LD_{50} from the test species LD_{50} (EFED default value of 1.15). In the case of assessing a small songbird, 20 g is a suitable value for AW. The test organism is a mallard duck which weighs about 2000 g and had an LD_{50} >2150 mg ai/kg-bwt; therefore, a conservative adjusted LD_{50} for a 20 g bird is 1078 mg ai/kg-bwt.

The LD_{50} for mammals can be adjusted for body weight based on the formula in USEPA (1993):

$$\text{Adj.LD}_{50} = \text{LD}_{50}\left(\frac{AW}{TW}\right)^{0.25}$$

where adjusted LD_{50} is the median 50% lethal dose for the species being assessed, LD_{50} is the median lethal dose in the test organism, AW is the body weight of the assessed organism, TW is the body weight for the test organism. In the case of assessing a small mammal, 35 g is a suitable value for AW. The test organism is a laboratory rat which had an LD_{50} = 1453 mg ai/kg-bwt and weighs about 350 g; therefore, the adjusted LD_{50} for a 35 g mammal is 2584 mg ai/kg-bwt.

Acute and chronic RQs for birds are summarized in Table 10; acute and chronic RQs for mammals are summarized in Table 11. Detailed calculations from TREX1.1 are provided in Appendix H. There were no acute LOC exceedances for birds or mammals. The Chronic LOCs were exceeded for both birds and mammals for all three proposed seed applications.

Table 10. Summary of avian risk quotients for difenoconazole treated seeds.

Crop	Avian risk quotients for difenoconazole (T-REXv1.1)		
	Acute (DOSE-BASED)	Acute (LD_{50}/sq ft)	Chronic (DIETARY-BASED)
Barley	0.06	0.01	1.94
Sweet Corn	0.07	<0.01	2.41
Cotton	0.08	<0.01	2.79

Table 11. Summary of mammalian risk quotients for difenoconazole treated seeds.

Crop	Mammalian risk quotients for difenoconazole (T-REXv1.1)		
	Acute (DOSE-BASED)	Acute (LD_{50}/sq ft)	Chronic (DIETARY-BASED)
Barley	0.01	<0.01	9.62
Sweet Corn	0.02	<0.01	12.03
Cotton	0.02	<0.01	13.95

3. Non-target Terrestrial, Semi-aquatic, and Aquatic Plants

Difenoconazole toxicity data for plants are not available; therefore, risks to plants cannot be assessed.

B. Risk Description - Interpretation of Direct Effects

1. Risks to Aquatic Organisms and Plants

Difenoconazole is a fungicide proposed to treat barley, sweet corn and cotton seed. Following seeding of treated seed, field runoff many contaminate adjacent ponds, streams, and lakes. Difenoconazole is persistent in the soil environment with biodegradation and hydrolysis occurring slowly. As the rate of soil photolysis is not known, it was assumed to be stable. It is slightly mobile (Koc's ranged from 3471 to 7734) in the soil. Volatilization from soil and water surfaces is not expected to be an important process since difenoconazole has a relatively low vapor pressure (3.32e-5 mm Hg). The overall stability of the compound suggests that difenoconazole will tend to accumulate in the soil with successive application (i.e., planting of treated seed) year to year. Difenoconazole has potential to reach surface water via run-off and spray drift, and is less likely to reach ground water.

Freshwater fish and aquatic invertebrates are not at an acute or chronic risk from exposure to difenoconazole (risk quotients were orders of magnitude less than the levels of concern) at the proposed application rate. Similar conclusions were reached for marine/estuarine fish and invertebrates, although chronic risk is based on an extrapolation using the acute-to-chronic ratios in freshwater species and the acute toxicity values for estuarine/marine species.

Risk to aquatic plants was not evaluated due to lack of data. Fungicides may be toxic to certain aquatic plants and hence aquatic plant data are needed even though the potential for aquatic exposure from seed treatment use is minimal.

2. Risks to Terrestrial Organisms and Plants

The results of the terrestrial risk characterization suggest that there are no acute risks associated with avian and mammalian exposures to difenoconazole. However, there are chronic risk concerns based on the submitted bird and mammal data. No plant data is available for this risk assessment; however, the registrant will be requested to submit this data when additional new uses are requested for difenoconazole. The risks associated with terrestrial organisms are discussed in greater detail below.

Birds

As shown in Table 10, all avian acute RQs are less than LOCs, with acute values ranging from <0.01 to 0.08. Avian Chronic RQs exceed LOCs with values ranging from1.94 to 2.79. Based on this analysis, listed and non-listed birds that feed on seeds may be at risk of experiencing chronic and reproductive effects if exposed to difenoconazole.

Avian Chronic LOCs (1.0) are exceeded for granivores. The chronic toxicity study showed that extended exposure to difenoconozole led to adverse effects on bird reproduction. The predicted EECs of 241 to 349 mg ai/kg-seed are comparable to the treatment levels tested in the mallard study (MRID 422451-06). At the 625 mg ai/kg diet treatment level, a statistically significant reduction in eggshell thickness (4.7%) was detected. No other treatment related effects were observed in mortality, growth, or reproduction. The statistical analysis for several response variables could not be verified as individual pen data were not provided, thus resulting in a Supplemental classification for this study. No acceptable or core avian reproduction studies were submitted to the Agency for bobwhite quail.

Mammals

As shown in Table 11, all mammalian acute RQs are less than LOCs, with acute values ranging from <0.01 to 0.02. Mammalian Chronic RQs exceed LOCs with values ranging from 9.62 to 13.95. Based on this analysis, listed and non-listed mammals that feed on seeds may be at risk of experiencing chronic and reproductive effects if exposed to difenoconazole.

Mammalian Chronic LOCs (1.0) are exceeded for granivores. The chronic toxicity study showed that extended exposure to difenoconozole led to adverse effects on mammal reproduction. The predicted EECs of 241 to 349 mg ai/kg-seed are comparable to the treatment levels tested in the laboratory rat study (MRID 422451-18). At the 250 mg ai/kg diet treatment level, a dose-related, but not statistically significant, decrease in F_0 female body weights was observed. Also at 250 mg ai/kg diet, there was a statistically significant reduction in body weights of F_1 males. At 2500 mg ai/kg diet, there was a significant reduction in male pup survival. For this endpoint (male pup survival) the NOAEC would be 250 mg ai/kg diet. Therefore, RQs calculated using that NOAEC based on male pup survival would be 0.96, 1.20, and 1.40 for barley, sweet corn, and cotton respectively, and there would still be Chronic LOC exceedances for sweet corn and cotton.

EFED based chronic RQs in mammals on the NOAEC for difenoconoazole in a 2-generation rat reproduction study. The observable effect associated with endpoint used in the risk assessment (NOAEC = 25 mg/kg-diet or NOAEL = 1.25 mg/kg-bw/day) is weight reduction in pups. The NOAEC for decreased pup survival from this study was 250 mg/kg-diet (NOAEL = 12.5 mg/kg-bw/day). This latter endpoint is more consistent with the NOAEL observed for developmental effects (increases in post-implantation loss and resorptions) in rabbits (NOAEL = 25 mg/kg-bw/day, MRID 42090017) and the NOAEL for developmental toxicity based on increased skeletal abnormalities in rats (100 mg/kg-bw/day, MRID 42090016). Using any of these higher NOAELs for more frank adverse effects would result in RQs below EFED LOCs. However, weight reduction in pups is still a potentially important endpoint of concern, as reduced weight gain may cause reduced fitness, which may in turn impact survival and other fitness parameters (reproduction success, ability to environmental incidents such as drought, heat, cold, or flooding, etc.).

Non-Target Insects

EFED currently does not quantify risks to terrestrial non-target insects. Risk quotients are therefore not calculated for these organisms. Difenoconazole was classified as practically non-toxic based on the acute contact honey bee study (LD_{50}>100 μg/bee); therefore, the potential for difenoconazole to have adverse effects on pollinators and other beneficial insects is low.

3. Potential for Wildlife Exposure Opportunities in Space and Time

In order for chemical residues in potential wildlife food items to result in direct adverse effects in a population of birds or mammals, the organisms must be exposed to those food items at locations and at times when the residues are present. There are a number of important questions that must be considered:

1. Are the residues present at locations where wildlife might feed?
2. Are the residues present in food items at times when wildlife might use the areas?
3. Are the residues likely to be around long enough to result in exposure sufficient to trigger the expected adverse responses?

Barley, sweet corn, and cotton fields are an important habitat and food source for birds and other wildlife. Gusey and Maturo (1973) provided a compilation of available data from many State Wildlife Management Agencies. These data supply information on species known to utilize agricultural fields, seasonal timing of use, intensity of use, and how the fields are used (feeding, nesting, cover, etc.). The species listings and animal groupings should not be considered an exhaustive list of all species using the crop fields. Timing of planting for the proposed crops was determined for several states using the Crop Profiles provided at http://pestdata.ncsu.edu/cropprofiles/cropprofiles.cfm. Together, this information will determine if there is the potential for wildlife exposure in space and time. Table 12 provides a summary of the crop planting dates and wildlife use for feeding.

Table 12. Planting dates and wildlife use as a food source for barley, sweet corn, and cotton.+

Crop/State	Planting dates	Wildlife Use Window of Crop Area as a Food Source#
Barley		
Kansas	March September-October	gamebirds: June-October waterfowl: October-May small mammal: March-May large mammal: October-March
Idaho	late February-mid May (depending on region)	gamebirds: year round waterfowl: March - May large mammals: April - May
Oregon	fall or spring	gamebirds: March - November waterfowl: July - February large mammals: September - March
Washington	April or September-October	gamebirds: year round waterfowl: year round songbirds: year round small mammal: March - November large mammal: year round
Utah	March 20 to May 10	gamebirds: April - October waterfowl: June/July and September-December small mammals: March-November large mammal: April - July
Colorado	March September-October	gamebirds: April-September waterfowl: September-January small mammal: May-September large mammal: June-August
Sweet Corn		
Illinois	1-2 weeks before frost-free to early July	gamebird: October-June* blackbird: July-August* small mammal: year-round*
Minnesota	May to July	gamebird: December-March* waterfowl: April-May and September-December* small mammal: September-March* large mammal: Jan-March*
Oklahoma	1-2 weeks before frost-free to early July	gamebird: November-February* waterfowl: October-February* small mammal: September-February* large mammal: October-January*
Indiana	1-2 weeks before frost-free to early July	gamebird: August-March* waterfowl: August-March* small mammal: August-March* large mammal: August-March*

Crop/State	Planting dates	Wildlife Use Window of Crop Area as a Food Source#
Maryland	March-July	gamebird: year-round waterfowl: year-round small mammal: year-round large mammal: year-round
Florida	August-April	small mammal: July-September large mammal: March-September
Kentucky	mid April to May	gamebird: June - April* waterfowl: October - January* songbirds: year round* small mammal: August - March* large mammal: July - November*
Cotton		
Arkansas	late April -early May	gamebird: May-November small mammal: July-August large mammal: May-July
Texas	February-June (depending on region of the state)	gamebird: October-November large mammal: April-November (depending on region)
Alabama	April 10 to May 20	gamebird: year round large mammal: April - May
Arizona	early March to mid May	birds: September - November
Mississippi	mid April to mid May	small mammals: July - September large mammals: June - September
Missouri	April 20 to May 20	no species noted to feed in cotton
Louisiana	mid April to mid May	large mammals: June - August

+ Only states for which planting information was available from the "crop profiles" and for which wildlife use information was available from Gusey and Maturo (1973) are listed.
# Gusey and Maturo (1973) provided species information, as supplied by the State Agencies. In this table, information was grouped into four categories. Gamebirds include pheasant, quail, morning dove, wild turkey, etc. Waterfowl include ducks and geese, etc. Small mammals include squirrels, raccoon, opossum, etc. Large mammals include deer, etc.
*Information is provided for all corn, not specific to sweet corn.

It is likely that birds and mammals would have the opportunity to use such treated areas for food and cover during the potential windows for seeding. In addition, it is likely that the period for application of treated seed will overlap active periods in bird and small mammal reproductive cycles. Therefore in terms of timing of application, potential chronic effects to birds and mammals remain from difenoconazole exposure.

4. Endocrine Disruption Assessment

The potential for endocrine disruptor related effects was observed in mammalian and avian toxicity studies submitted to the Agency. In the 2-generation reproduction study with rats (MRID 420900-18), decreased parental body weight gain and decreased mean pup weight resulted in NOAEC and LOAEC values of 25 and 250 mg ai/kg-diet, respectively. In a mallard duck reproduction study (MRID 422451-06), there were statistically significant reductions in egg shell thickness resulting in NOAEC and LOAEC values of 125 and 625 mg/kg diet, respectively. In addition, statistical analyses could not be conducted on many endpoints (adult body weight, adult food consumption, offspring body weight at hatch and at 14 days of age, and 14-day survival) could not be verified as the raw data were not provided. These reproductive effects could be an indicator of potential endocrine disruption in birds and mammals.

There are a number of degradates of difenoconazole, which are formed by biotic and abiotic processes. Until such time as the Agency determines that any of these degradates have the potential to be an endocrine disruptor, this risk assessment has not included an evaluation of the relative risk of difenoconazole degradates for endocrine disruption and as such is a source of uncertainty in this assessment.

EPA is required under the Federal Food, Drug, and Cosmetic Act (FFDCA), as amended by the Food Quality Protection Act (FQPA), to develop a screening program to determine whether certain substances (including all pesticide active and other ingredients) "may have an effect in humans that is similar to an effect produced by a naturally occurring estrogen, or other such endocrine effects as the Administrator may designate." Following the recommendations of its Endocrine Disruptor Screening and Testing Advisory Committee (EDSTAC), EPA determined that there were scientific bases for including, as part of the program, the androgen and thyroid hormone systems, in addition to the estrogen hormone system. EPA also adopted EDSTAC's recommendation that the Program include evaluations of potential effects in wildlife. For pesticide chemicals, EPA will use The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) and, to the extent that effects in wildlife may help determine whether a substance may have an effect in humans, FFDCA authority to require the wildlife evaluations. As the science develops and resources allow, screening of additional hormone systems may be added to the Endocrine Disruptor Screening Program (EDSP). When the appropriate screening and/or testing protocols being considered under the Agency's EDSP have been developed, difenoconazole may be subjected to additional screening and/or testing to better characterize effects related to endocrine disruption.

C. Threatened and Endangered Species (Listed Species) Concerns

1. Action Area

For listed species assessment purposes, the action area is considered to be the area affected directly or indirectly by the Federal action and not merely the immediate area involved in the action. At the initial screening-level, the risk assessment considers broadly described taxonomic groups and so conservatively assumes that listed species within those broad groups are collocated with the pesticide treatment area. This means that terrestrial plants and wildlife are assumed to be located on or adjacent to the treated site and aquatic organisms are assumed to be located in a surface water body adjacent to the treated site. The assessment also assumes that the listed species are located within an assumed area which has the relatively highest potential exposure to the pesticide, and that exposures are likely to decrease with distance from the treatment area. This risk assessment presents the use of difenoconazole on barley, sweet corn, and cotton fields and establishes initial collocation of species with treatment areas.

If the assumptions associated with the screening-level action area result in RQs that are below the listed species LOCs, a "no effect" determination conclusion is made with respect to listed species in that taxa, and no further refinement of the action area is necessary. Furthermore, RQs below the listed species LOCs for a given taxonomic group indicate no concern for indirect effects upon listed species that depend upon the taxonomic group covered by the RQ as a resource. However, in situations where the screening assumptions lead to RQs in excess of the listed species LOCs for a given taxonomic group, a potential for a "may affect" conclusion exists and may be associated with direct effects on listed species belonging to that taxonomic group or may extend to indirect effects upon listed species that depend upon that taxonomic group as a resource. In such cases, additional information on the biology of listed species, the locations of these species, and the locations of use sites could be considered to determine the extent to which screening assumptions regarding an action area apply to a particular listed organism. These subsequent refinement steps could consider how this information would impact the action area for a particular listed organism and may potentially include areas of exposure that are downwind and downstream of the pesticide use site.

2. Taxonomic Groups Potentially at Risk

Based on available screening level information, it is unlikely that difenoconazole will have toxic effects on endangered or threatened aquatic organisms as no Endangered Species LOCs were exceeded. There are no Acute LOC's exceeded for mammals or birds. The Chronic LOC's are exceeded for birds and mammals consuming seeds. Threatened and Endangered birds and mammals may potentially be affected through chronic exposure. Based on chronic exceedances for birds and for mammals, there is the potential for direct toxic effects to these endangered and threatened species, if exposure occurs. The LOCATES database (version 2.9.7) was used to identify those U.S. counties that grow barley, sweet corn, or cotton and that have federally-listed endangered or threatened species. In addition, federally-listed reptiles and amphibians (terrestrial phase) were also identified using LOCATESv2.9.7 as birds are used as their surrogate species. A preliminary analysis has been conducted of this county overlap of crop and listed species.

The complete list of endangered and threatened species is provided in Appendix G. Because this proposed use of difenoconazole is a seed treatment, it was assumed that only species that consume seeds (granivores and omnivores) are at risk of direct effects. There were no listed reptiles or amphibians that consume seeds. Several web services were used to identify which listed species consume seeds:
http://www.natureserve.org/explorer/servlet/NatureServe,

http://www.fws.gov/endangered/wildlife.html, http://fwie.fw.vt.edu/states/nm.htm, and http://esrp.csustan.edu/. Those species at risk of chronic effects are listed below:

Granivorious birds -

Masked Bobwhite (*Colinus virginianus ridgwayi*), San Clemente Sage Sparrow *(Amphispiza belli clementeae)*, Florida Shrub Jay *(Aphelocoma coerulescens coerulescens)*, Cape Sable Seaside Sparrow *(Ammodramus maritimus mirabilis)*, Florida Grasshopper Sparrow *(Ammodramus savannarum floridanus)*,Florida Grasshopper Sparrow *(Ammodramus savannarum floridanus)*, Hawaiian coot *(Fulica americana alai)*, Hawaiian duck *(Anas wyvilliana)*, Laysan finch *(Telespyza cantans)*, Nihoa finch *(Telespyza ultima)*, Hawaiian goose *(Branta (=Nesochen) sandvicensis)*, Hawaiian common moorhen *(Gallinula chloropus sandvicensis)*, Mississippi sandhill crane *(Grus canadensis pulla)*, and Attwater's Greater Prairie Chicken (*Tympanuchus cupido attwateri*).

Granivorious and omnivorous mammals -

Alabama Beach Mouse *(peromyscus polionotus ammobates)*, Perdido Key Beach Mouse *(peromyscus polionotus trissyllepsis)*, Fresno Kangaroo Rat (*Dipodomys nitratoides exilis*), Giant Kangaroo Rat (*Dipodomys ingens*), San Bernardino Kangaroo Rat (*Dipodomys merriami parvus*), Morro Bay Kangaroo Rat (*Dipodomys heermanni morroensis*), Stephens Kangaroo Rat (*Dipodomys stephensi*), Tipton Kangaroo Rat (*Dipodomys nitratoides nitratoides*), Pacific Pocket Mouse (*Perognathus longimembris pacificus*), Amargosa Vole *(Microtus montanus nevadensis)*, Preble's Meadow Jumping Mouse *(Zapus hudsonius preblei)*, Delmarva Peninsula Fox Squirrel *(Sciurus niger cinereus)*, Anastasia island beach mouse *(Peromyscus polionotus phasma)*, Choctawhatchee beach mouse *(Peromyscus polionotus allophrys)*, Southeastern beach mouse *(Peromyscus polionotus niveiventris)*, Grizzly bear *(Ursus arctos horribilis)*, Northern Idaho Ground Squirrel *(Spermophilus brunneus brunneus)*, American black bear *(Ursus americanus)*, Louisiana black bear *(Ursus americanus luteolus)*, Carolina Northern Flying Squirrel *(Glaucomys sabrinus coloratus)*, Columbian white-tailed deer *(Odocoileus virginianus leucurus)*, and Virginia Northern Flying Squirrel *(Glaucomys sabrinus fuscus)*.

With additional refinement by exploring more detailed species biology (e.g., geographic location, specific feeding habits, time of year likely to utilize crop fields), some species listed above may be determined to be not likely to be affected.

3. <u>Use of Probit Slope Response Relationship to Provide Information on the Endangered Species Levels of Concern</u>

The Agency uses the probit dose response relationship as a tool for providing additional information on the listed animal species acute levels of concern. The acute listed species LOCs of 0.1 and 0.05 are used for terrestrial and aquatic animals, respectively. As part of the risk characterization, an interpretation of acute LOCs for listed species is discussed. This interpretation is presented in terms of the chance of an individual event (i.e., mortality or immobilization) should exposure at the estimated environmental concentration actually occur for a species with sensitivity to difenoconazole on par with the acute toxicity endpoint selected for RQ calculation. To accomplish this interpretation, the Agency uses the slope of the dose response relationship available from the toxicity study used to establish the acute toxicity measurement endpoints for each taxonomic group. The individual effects probability associated with the LOCs is based on the mean estimate of the slope and an assumption of a probit dose response relationship. In addition to a single effects probability estimate based on the mean, upper and lower estimates of the effects probability are also provided to account for variance in the slope. The upper and lower bounds of the effects probability are based on available information on the 95% confidence interval of the slope. A statement regarding the confidence in the applicability of the assumed probit dose response relationship for predicting individual event probabilities is also included. Studies with good probit fit characteristics (i.e., statistically appropriate for the data set) are associated with a high degree of confidence. Conversely, a low degree of confidence is associated with data from studies that do not statistically support a probit dose response relationship. In addition, confidence in the data set may be reduced by high variance in the slope (i.e., large 95% confidence intervals), despite good probit fit characteristics.

Individual effect probabilities are calculated based on an Excel spreadsheet tool IECV1.1 (Individual Effect Chance Model Version 1.1) developed by Ed Odenkirchen of the U.S. EPA, OPP, Environmental Fate and Effects Division (June 22, 2004). The model allows for such calculations by entering the mean slope estimate (and the 95% confidence bounds of that estimate) as the slope parameter for the spreadsheet. In addition, the LOC (0.1 for terrestrial animals and 0.05 for aquatic animals) is entered as the desired threshold.

Freshwater fish

Due to lack of partial mortalities (only one partial mortality observed) derived from the concentration range tested in the submitted study, the probit statistical model could not be used, and therefore the slope of the mortality curve could not be determined. Instead, the binomial statistical model was used to determine the LC_{50} values. Therefore, event probability was calculated for the exceeded LOC based on a default probit slope assumption of 4.5 with confidence intervals of 2 and 9 as per original Agency assumptions of typical slope cited in Urban and Cook (1986). The corresponding estimated chance of individual mortality associated with the listed species LOC of 0.05 the acute toxic endpoint for freshwater fish is 1 in 418,000,000. It is recognized that extrapolation of very low probability events is associated with considerable uncertainty in the resulting estimates. To explore possible bounds to such estimates, the default upper and lower values for the default slope estimate were used to calculate upper and lower estimates of the effects probability associated with the listed species LOC. These values are 1 in 216 and 1 in 1.75E+31. Although the Agency has assumed a probit dose response relationship in establishing the listed species LOCs, the available data for the toxicity study generating RQs for this taxonomic group do not statistically support a probit dose response relationship and so the confidence in estimated event probabilities based on this dose response relationship and the listed species LOC is low.

Freshwater invertebrates

Based on an assumption of a probit dose response relationship with a mean estimated slope of 4.1, the corresponding estimated chance of individual mortality associated with the listed species LOC of 0.05 the acute toxic endpoint for freshwater invertebrates is 1 in 20,800,000. It is recognized that extrapolation of very low probability events is associated with considerable uncertainty in the resulting estimates. To explore possible bounds to such estimates, the upper and lower values for the mean slope estimate (2.5, 5.7) were used to calculate upper and lower estimates of the effects probability associated with the listed species LOC. These values are 1 in 1750 and 1 in 1.66E+13.

Estuarine/Marine Fish

Due to mortality pattern that provided an unrealistic LC_{50} estimate from a probit model, the probit statistical model was not used, and therefore the slope of the mortality curve could not be determined. Instead, the binomial statistical model was used to determine the LC_{50} values. Therefore, event probability was calculated for the exceeded LOC based on a default probit slope assumption of 4.5 with confidence intervals of 2 and 9 as per original Agency assumptions of typical slope cited in Urban and Cook (1986). The corresponding estimated chance of individual mortality associated with the listed species LOC of 0.05 the acute toxic endpoint for estuarine/marine fish is 1 in 418,000,000. It is recognized that extrapolation of very low probability events is associated with considerable uncertainty in the resulting estimates. To explore possible bounds to such estimates, the default upper and lower values for the default slope estimate were used to calculate upper and lower estimates of the effects probability associated with the listed species LOC. These values are 1 in 216 and 1 in 1.75E+31. Although the Agency has assumed a probit dose response relationship in establishing the listed species LOCs, the available data for the toxicity study generating RQs for this taxonomic group do not support a probit dose response relationship and so the confidence in estimated event probabilities based on this dose response relationship and the listed species LOC is low.

Estuarine/marine invertebrates

Based on an assumption of a probit dose response relationship with a mean estimated slope of 4.7, the corresponding estimated chance of individual mortality associated with the listed species LOC of 0.05 the acute toxic endpoint for estuarine/marine invertebrates is 1 in 2,070,000,000. It is recognized that extrapolation of very low probability events is associated with considerable uncertainty in the resulting estimates. To explore possible bounds to such estimates, the upper and lower values for the mean slope estimate (2.7, 6.8) were used to calculate upper and lower estimates of the effects probability associated with the listed species LOC. These values are 1 in 4510 and 1 in 2.22E+18.

Avian - single oral dose

As no mortality was observed at any dosage in the mallard duck single oral dose study (highest dosage was 2150 mg ai/kg-bwt), no definitive estimate of an LD_{50} or slope was available. As such, no probit slope analysis was performed.

Avian - dietary

Due to lack of partial mortalities (only one partial mortality observed) derived from the concentration range tested in the submitted study, the probit statistical model could not be used, and therefore the slope of the mortality curve could not be determined. Instead, the binomial statistical model was used to determine the LC_{50} values. Therefore, event probability was calculated for the exceeded LOC based on a default probit slope assumption of 4.5 with confidence intervals of 2 and 9 as per original Agency assumptions of typical slope cited in Urban and Cook (1986). The corresponding estimated chance of individual mortality associated with the listed species LOC of 0.10 the acute toxic endpoint for birds is 1 in 294,000. It is recognized that extrapolation of very low probability events is associated with considerable uncertainty in the resulting estimates. To explore possible bounds to such estimates, the default upper and lower values for the default slope estimate were used to calculate upper and lower estimates of the effects probability associated with the listed species LOC. These values are 1 in 44 and 1 in 8.86E+18. Although the Agency has assumed a probit dose response relationship in establishing the listed species LOCs, the available data for the toxicity study generating RQs for this taxonomic group do not statistically support a probit dose response relationship and so the confidence in estimated event probabilities based on this dose response relationship and the listed species LOC is low.

Mammal - acute oral

Based on an assumption of a probit dose response relationship with an estimated slope of 3.22, the corresponding estimated chance of individual mortality associated with the listed species LOC of 0.10 the acute toxic endpoint for mammals is 1 in 1,530. It is recognized that extrapolation of very low probability events is associated with considerable uncertainty in the resulting estimates. To explore possible bounds to such estimates, the upper and lower values for the slope estimate (-36, 42) are typically used to calculate the upper and lower estimates of the effects probability associated with the listed species LOC. Although the Agency has assumed a probit dose response relationship in establishing the listed species LOCs, the available data for the toxicity study generating RQs for this taxonomic group do not statistically support a probit dose response relationship ($p=0.02$) and so the confidence in estimated event probabilities based on this dose response relationship and the listed species LOC is low. Because of the poor fit to the probit curve, the wide confidence intervals for the slope and the negative lower bound of the slope, the upper and lower estimates of the effects probabilities were not calculated.

4. <u>Indirect Effect Analyses</u>

The Agency acknowledges that pesticides have the potential to exert indirect effects upon the listed organisms by, for example, perturbing forage or prey availability, altering the extent of nesting habitat, etc. In conducting a screen for indirect effects, direct effect LOCs for each taxonomic group are used to make inferences concerning the potential for indirect effects upon listed species that rely upon non-endangered organisms in these taxonomic groups as resources critical to their life cycle.

Screening-level Chronic RQs for birds and mammals exceed LOCs for seeds; therefore, there may be a potential concern for indirect effects. As such, the nature of the chronic toxicological endpoint, Services-provided "species profiles", and further evaluation of the geographical and temporal nature of the exposure are considered to determine if a rationale for a "not likely to adversely effect" determination is possible.

Based on the chronic risks for birds and mammals on a dietary basis, there may be potential indirect effects to species of birds and mammals that depend on terrestrial organisms as a source of food. The chronic effects observed in the toxicity studies involved reductions in reproductive abilities for both taxa. Of particular concern would be the terrestrial wildlife populations that feed in or near barley, sweet corn, or cotton fields and those that rely on mammals or birds as a primary food source. In Section IV.B.3 of this document, it was shown that there is a potential for wildlife exposure to difenoconazole residues in time and space. Non-listed and listed animals such as raptors (hawks and owls), coyotes, and foxes that feed on small mammals (cottontail rabbit, mice, voles, and other rodents) may be indirectly affected by chronic levels of difenoconazole found in their food source. Predators that feed on birds, including waterfowl, may also be affected by food chain transfer. Although difenoconazole does rapidly bioaccumulate, depuration is also rapid (MRID 422451-42), thereby reducing food chain effects of the residues. Other indirect effects, such as reduced prey availability, may occur if reductions in populations of small mammals or bird populations occur due to chronic residue exposure.

D. Description of Assumptions, Uncertainties, Strengths, and Limitations

1. <u>Assumptions and Limitations Related to Exposure for all Taxa</u>

There are a number of areas of uncertainty in the aquatic and terrestrial risk assessments. The toxicity assessment for terrestrial and aquatic animals is limited by the number of species tested in the available toxicity studies. Use of toxicity data on representative species does not provide information on the potential variability in susceptibility to acute and chronic exposures.

This screening-level risk assessment relies on labeled statements of the maximum rate of difenoconazole application, the maximum number of applications, and the shortest interval between applications. Together, these assumptions constitute a maximum use scenario. The frequency at which actual uses approach these maximums is dependant on resistance to the fungicide, timing of applications, and market forces.

2. <u>Assumptions and Limitations Related to Exposure for Aquatic Species</u>

Data gaps

A soil photolysis study (Guideline 161-3, OPPTS 835.241) is requested. Both the natural and artificial sunlight studies that were submitted (MRID 422451-30) were not scientifically valid and did not provide useful information on the photodegredation of difenoconazole on sandy loam soil. The natural and artificial sunlight studies were not scientifically valid for the following reasons: (1) the soil was too finely sieved, (2) the soil moisture content was not adjusted to or maintained at 75% of 0.33 bar, (3) soil viability was not assured, and (4) the incubation temperature was not held constant. In addition, in the artificial light study, the material balances were > 110% and replicate samples were not used. This study would provide a better understanding of the fate of difenoconazole. Since soil degradation, aquatic degradation and degradation by hydrolyis is slow (half-lives range from 93 days to stable), but degradation by aqueous photolysis is relatively fast (half-life = 6 days), soil photolysis may be an important route of degradation. Understanding this route would provide a better characterization of the fate of difenoconazole in the environment, especially of its availability for runoff into water bodies.

Exposure averaging times

For an acute risk assessment, there is no averaging time for exposure. An instantaneous peak concentration, with a 1 in 10 year return frequency, is assumed. The use of the instantaneous peak assumes that instantaneous exposure is of sufficient duration to elicit acute effects comparable to those observed over more protracted exposure periods tested in the laboratory, typically 48 to 96 hours. In the absence of data regarding time-to-toxic event analyses and latent responses to instantaneous exposure, the degree to which risk is overestimated cannot be quantified.

3. <u>Assumptions and Limitations Related to Exposure for Terrestrial Species</u>

Variation in habitat and dietary requirements

For screening terrestrial risk assessments, a generic bird or mammal is assumed to occupy either the treated field or adjacent areas receiving pesticide at a rate commensurate with the treatment rate on the field. The habitat and feeding requirements of the modeled species and the wildlife species may be different. It is assumed that species occupy, exclusively and permanently, the treated area being modeled. This assumption leads to a maximum level of exposure in the risk assessment.

The acute studies have a fixed exposure period, not allowing for the differences in response of individuals to different durations of exposure. Further, for the acute oral study, difenoconazole is administered in a single dose which does not mimic wild birds' exposure through multiple feedings. Also, it does not account for the effect of different environmental matrices on the absorption rate of the chemical into the animal. Because exposure occurs over several days, both the accumulated dose and elimination of the chemical from the body for the duration of the exposure determine the exact exposure to wildlife, however they are not taken into account in the screening assessment. There was also no assumption of an effect of repeated doses that change the tolerance of an individual to successive doses.

Variation in diet composition

The risk assessment and calculated RQs assume 100% of the diet is relegated to treated seed. The assumption of 100% diet from treated seed type may be realistic for acute exposures, but diets are likely to be more variable over longer periods of time. This assumption is likely to be conservative and will tend to overestimate potential risks for chronic exposure, especially for larger organisms that have larger home ranges. These large animals (e.g., deer and geese) will tend to forage from a variety of areas and move on and off of treated fields. Small animals (e.g., mice, voles, and small birds) may have home ranges smaller than the size of a treated field and will have little or no opportunity to obtain foodstuffs that have not been treated with difenoconazole. Even if their home range does cover area outside the treated field, difenoconazole may have runoff to areas adjacent to the treated field.

Based on the shallow planting of seeds treated with difenoconazole, EFED made the conservative assumption that at least some of the treated seed would be available and would constitute 100% of the diet. Seeds can comprise almost the entire diet of some species of small birds (e.g., redpolls, sparrows, and finches) during the late winter and early spring (Martin et al., 1951).

Exposure routes other than dietary

Only dietary exposure is included in the exposure assessment. Other exposure routes are possible for animals in treated areas. These routes include ingestion of contaminated drinking water, ingestion of contaminated soils, dermal contact, inhalation, and preening. Given that difenoconazole is soluble in water there exists the potential to dissolve in runoff and puddles on the treated field may contain the chemical. Consumption of drinking water would appear to be inconsequential if water concentrations were equivalent to the low concentrations from GENEEC. However, if difenoconazole does not readily sorb to the seed coat, concentrations in puddles in the planted field could be expected to be higher, and so the drinking water route remains an unquantified concern. Similarly, consumption of soil and grit from the treated field would pose low risk if difenoconazole sorbs to the seed coat. Given the high affinity for organic carbon, it is unlikely that the compound disassociates from the seed to a great extent. Available data suggests that up to 15% of the diet can consist of incidentally ingested soil depending on the species and feeding strategy (Beyer et al, 1994). Because of difenoconazole's persistence in soils, this may be an important exposure pathway.

The screening assessment does not consider dermal exposure. Dermal exposure may occur through three potential sources: (1) direct application of spray to terrestrial wildlife in the treated area or within the drift footprint, (2) incidental contact with contaminated vegetation, or (3) contact with contaminated water or soil. Dermal contact is not likely to be a great contributor to overall pesticide load to wildlife because of the seed treatment method of application. Because difenoconazole does not volatilize appreciably (v.p. 3.3 X 10^{-5} mm Hg at 25°C), inhalation does not appear to be a significant contributor to overall exposure.

Preening exposures, involving the oral ingestion of material from the feathers remains an unquantified, but potentially important, exposure route.

Screening-level risk assessments for spray applications of pesticides consider dietary exposure to terrestrial organisms. Other exposure routes are possible for animals residing in or moving through treated areas. These routes include ingestion of contaminated drinking water, ingestion of contaminated soils, preening/grooming, and dermal contact. Preening exposures, involving the oral ingestion of material from the feathers remains an unquantified, but potentially important, exposure route. If toxicity is expected through any of these other routes of exposure, then the risks of a toxic response to difenoconazole is underestimated in this risk assessment.

Dietary Intake - The Differences Between Laboratory and Field Conditions

There are several aspects of the dietary test that introduce uncertainty into calculation of the LC_{50} value (Mineau, Jobin, and Baril, 1994; ECOFRAM, 1999). The endpoint of this test is reported as the concentration mixed with food that produces a response rather than as the dose ingested. Although food consumption sometimes allows for the estimate of a dose, calculations of the mg/kg/day are confounded by undocumented spillage of feed and how consumption is measured over the duration of the test. Usually, if measured at all, food consumption is estimated once at the end of the five-day exposure period. Further, group housing of birds undergoing testing only allows for a measure of the average consumption per day for a group; consumption estimates can be further confounded if birds die within a treatment group. The exponential growth of young birds also complicates the estimate of the dose; controls often nearly double in size over the duration of the test. Since weights are only taken at the initiation of the exposure period and at the end, the dose per body weight (mg/kg) is difficult to estimate with any precision. The interpretation of this test is also confounded because the response of birds is not only a function of the intrinsic toxicity of the pesticide, but also the willingness of the birds to consume treated food.

Further, the acute and chronic characterization of risk rely on comparisons of wildlife dietary residues with LC_{50} or NOAEC values expressed in concentrations of pesticides in laboratory feed. These comparisons assume that ingestion of food items in the field occurs at rates commensurate with those in the laboratory. Although the screening assessment process adjusts dry-weight estimates of food intake to reflect the increased mass in fresh-weight wildlife food intake estimates, it does not allow for gross energy and assimilative efficiency differences between wildlife food items and laboratory feed. On gross energy content alone, direct comparison of a laboratory dietary concentration- based effects threshold to a fresh-weight pesticide residue estimate would result in an underestimation of field exposure by food consumption by a factor of

1.25 - 2.5 for most food items. Only for seeds would the direct comparison of dietary threshold to residue estimate lead to an overestimate of exposure.

Differences in assimilative efficiency between laboratory and wild diets suggest that current screening assessment methods do not account for a potentially important aspect of food requirements. Depending upon species and dietary matrix, bird assimilation of wild diet energy ranges from 23 - 80%, and mammal's assimilation ranges from 41 - 85% (U.S. Environmental Protection Agency, 1993). If it is assumed that laboratory chow is formulated to maximize assimilative efficiency (e.g., a value of 85%), a potential for underestimation of exposure may exist by assuming that consumption of food in the wild is comparable with consumption during laboratory testing. In the screening process, exposure may be underestimated because metabolic rates are not related to food consumption.

Finally, the screening procedure does not account for situations where the feeding rate may be above or below requirements to meet free living metabolic requirements. Gorging behavior is a possibility under some specific wildlife scenarios (e.g., bird migration) where the food intake rate may be greatly increased. Kirkwood (1983) has suggested that an upper-bound limit to this behavior might be the typical intake rate multiplied by a factor of 5. In contrast is the potential for avoidance, operationally defined as animals responding to the presence of noxious chemicals in their food by reducing consumption of treated dietary elements. This response is seen in nature where herbivores avoid plant secondary compounds.

In the absence of additional information, the acute oral LD_{50} test provides the best estimate of acute effects for chemicals where exposure can be considered to occur over relatively short feeding periods, such as the diurnal feeding peaks common to avian species (ECOFRAM, 1999).

Incidental Pesticide Releases Associated with Use

This risk assessment is based on the assumption that the entire treatment area is subject to difenoconazole application at the rates specified on the label. In reality, there is the potential for uneven application of difenoconazole through such plausible incidents as changes in calibration of application equipment, spillage, and localized releases at specific areas of the treated field that are associated with specifics of the type of application equipment used (e.g., increased application at turnabouts when using older application equipment).

4. <u>Assumptions and Limitations Related to Effects Assessment</u>

Data gaps

Chronic estuarine/marine fish and invertebrate studies were not provided for this risk assessment. The toxicity values for these species were estimated based on freshwater acute to chronic ratios. These studies will be requested if additional uses are proposed that have higher application rates.

This risk assessment does not estimate risk for sediment dwelling organisms because a toxicity study was not provided. Because difenoconazole is persistent and has a high Koc, concentrations in sediment are expected to be higher than those present in the water column. A study determining the toxicity of difenoconazole residues to benthic organisms is requested.

Terrestrial and aquatic plant studies were not available for this risk assessment. Fungicides may be toxic to certain aquatic plants and hence aquatic plant data are needed even though the potential for aquatic exposure from seed treatment use is minimal. Aquatic plant studies for the suite of five species will be required if additional uses are proposed that have higher application rates and/or greater potential for exposure. A brief review of aquatic plant data for other pesticides in this same class (conazole) does indicate toxicity to aquatic plants. For example, toxicity testing with propiconizole technical (PCcode 122101) resulted in EC_{50}s ranging from 4.8 to 9.02 mg ai/L for *Lemna gibba* and from 0.021 to 13.58 mg ai/L for non-vascular aquatic plants. Bromuconazole (PCcode 120503) toxicity testing resulted in EC_{50}s ranging from 0.053 to 1.27 mg ai/L for the suite of five aquatic plant species.

Terrestrial plant data is requested if additional uses are planned that have higher application rates and/or have greater potential for exposure. In addition, if any non-seed treatment uses are to be proposed for difenoconazole, terrestrial plant data will be required. A brief review of terrestrial plant data for other pesticides in this same class (conazole) does indicate toxicity to terrestrial plants. For example, toxicity testing with propiconizole technical (PCcode 122101) resulted in EC_{25}s ranging from 0.039 to >1.5 lbs ai/acre for the seedling emergence and the vegetative vigor studies. Cyproconazole (PCcode 128993) Tier I toxicity testing resulted in NOAECs ranging from 0.077 to 0.617 lbs ai/acre for the seedling emergence and the vegetative vigor studies.

An earthworm toxicity study was submitted to the Agency (MRID 422451-25). The study is currently under review. Because of the potential for difenoconazole to accumulate in the soil, the potential for effects to soil organisms is relevant.

Age class and sensitivity of effects thresholds

It is generally recognized that test organism age may have a significant impact on the observed sensitivity to a toxicant. The screening risk assessment acute toxicity data for fish are collected on juvenile fish between 0.1 and 5 grams. Aquatic invertebrate acute testing is performed on recommended immature age classes (e.g., first instar for daphnids, second instar for amphipods, stoneflies and mayflies, and third instar for midges). Similarly, acute dietary testing with birds is also performed on juveniles, with mallard being 5-10 days old and quail 10-14 days old.

Testing of juveniles may overestimate toxicity of older age classes for pesticidal active ingredients, such as difenoconazole, that act directly (without metabolic transformation) because younger age classes may not have the enzymatic systems associated with detoxifying xenobiotics. The screening risk assessment has no current provisions for a generally applied method that accounts for this uncertainty. In so far as the available toxicity data may provide ranges of sensitivity information with respect to age class, the risk assessment uses the most sensitive life-stage information as the conservative screening endpoint.

Use of the Most Sensitive Species Tested

Although the screening risk assessment relies on a selected toxicity endpoint from the most sensitive species tested, it does not necessarily mean that the selected toxicity endpoint reflect sensitivity of the most sensitive species existing in a given environment. The relative position of the most sensitive species tested in the distribution of all possible species is a function of the overall variability among species to a particular chemical. In the case of listed species, there is uncertainty regarding the relationship of the listed species' sensitivity and the most sensitive species tested.

The Agency is not limited to a base set of surrogate toxicity information in establishing risk assessment conclusions. The Agency also considers toxicity data on non-standard test species when available.

LITERATURE CITED

Beyer, W. N., E. E. Connor and S. Gerould. 1994. Estimates of Soil Ingestion by Wildlife. Journal of Wildlife Management. 58(2):375-382.

ECOFRAM. 1999. ECOFRAM Terrestrial Draft Report. Ecological Committee on FIFRA Risk Assessment Methods. USEPA, Washington D.C.

Gusey W.F., Z.D. Maturgo. 1973. Wildlife Utilization of Croplands. Environmental Conservation Department. Shell Oil Company, Houston, TX.

Kirkwood, J. 1983. A limit to metabolizable energy intake in mammals and birds. Comp. Biochem. Physiol. 75A:1-3.

Martin, C. M., H. S. Zim & A. C. Nelson, 1951. American Wildlife and Plants - A Guide to Wildlife Food Habits, Dover Publ. Inc., New York.

Mineau, P., B. Jobin and A. Baril. 1994. A critique of the avian 5-day dietary test (LC50) as the basis of avian risk assessment. Technical Report No. 215, Headquarters, Canadian Wildlife Service, Hull, Quebec. p. 23.

NatureServe. 2005. NatureServe Explorer: An online encyclopedia of life [web application]. Version 4.5. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer.

Urban D.J. and N.J. Cook. 1986. Hazard Evaluation Division Standard Evaluation Procedure Ecological Risk Assessment. EPA 540/9-85-001. U.S. Environmental Protection Agency, Office of Pesticide Programs, Washington, DC.

USEPA. 1993. Wildlife Exposure Factors Handbook. Volume I of II. EPA/600/R-93/187a. Office of Research and Development, Washington, D. C. 20460. EPA/600/R-93/187a.

USEPA. 2002. Guidance for Selecting Input Parameters in Modeling the Environmental Fate and Transport of Pesticides Input Parameter Guidance. Version II February 28, 2002. U.S. Environmental Protection Agency, Office of Pesticide Programs, Environmental Fate and Effects Division.

APPENDIX A: Status of Fate and Ecological Effects Data Requirements for Difenoconazole

Table A-1: Environmental Fate Data Requirements for Difenoconazole				
Guideline #		Data Requirement	MRID #'s	Data Requirement Status
161-1	835.212	Hydrolysis	422451-27	Acceptable
161-2	835.224	Photodegradation in Water	422451-28	Supplemental
161-3	835.241	Photodegradation on Soil	422451-30	Invalid (sample preparation, soil moisture content, incubation methods not valid)
161-4	835.237	Photodegradation in Air	NA	Reserved
162-1	835.41	Aerobic Soil Metabolism	422451-31 422451-32 422451-33	Supplemental Supplemental Supplemental
162-2	835.42	Anaerobic Soil Metabolism	422451-32 422451-33	Supplemental Supplemental
162-3	835.44	Anaerobic Aquatic Metabolism	422451-34	Supplemental
162-4	835.43	Aerobic Aquatic Metabolism	422451-34	Supplemental
163-1	835.1240 835.1230	Leaching-Adsorption/Desorption	422451-35 422451-36	Supplemental Supplemental
163-2	835.141	Laboratory Volatility	NA	Not satisfied
163-3	835.81	Field Volatility	NA	Not satisfied
164-1	835.61	Terrestrial Field Dissipation	422451-40	Supplemental
164-2	835.62	Aquatic Field Dissipation	NA	No registered aquatic uses
164-3	835.63	Forestry Dissipation	NA	No registered forestry uses
165-4	850.173	Accumulation in Fish	422451-42	Acceptable
201-1	840.11	Droplet Size Spectrum	NA	①
202-1	840.12	Drift Field Evaluation	NA	①

① Member of Spray-Drift Task Force.

Table A-2: Ecological Effects Data Requirements for Difenoconazole				
Guideline #		Data Requirement	Species / MRID	Study Classification
71-1	850.2100	Avian Oral LD_{50}	Mallard 422451-05	Core
71-2	850.2200	Avian Dietary LC_{50}	Mallard 422451-04	Core
			Bobwhite quail 422451-03	Core
71-4	850.2300	Avian Reproduction	Mallard 422451-06	Supplemental (Statistical analyses of adult body weight, adult food consumption, offspring body weight at hatch and at 14 days of age, and 14-day survival could not be verified, since the report did not provide these data on a per pen basis.)
			Bobwhite quail 422806-01	Invalid (unacceptably high adult mortality)
72-1	850.1075	Freshwater Fish LC_{50}	Bluegill 422451-09	Core
			Rainbow 422451-07	Core
			Rainbow 422451-08	Core
72-2	850.1010	Freshwater Invertebrate Acute LC_{50}	Daphnia 422451-10	Core
72-3(a)	850.1075	Estuarine/Marine Fish LC_{50}	Sheepshead minnow 422451-12	Core
			Sheepshead minnow 429067-02	Core
72-3(b)	850.1025	Estuarine/Marine Mollusk EC_{50}	Eastern oyster shell 422451-13	Core
			Eastern oyster shell 429067-01	Core
72-3(c)	850.1035 850.1045	Estuarine/Marine Shrimp EC_{50}	Mysid 422451-11	Core
72-4(a)	850.1400	Fish Early Life-Stage	Fathead minnow 422451-15	Supplemental (control contamination in two replicates and large relative standard deviation for fish weight in one control replicate)

Table A-2: Ecological Effects Data Requirements for Difenoconazole				
Guideline #		Data Requirement	Species / MRID	Study Classification
			Fathead minnow 451375-02	Invalid (only 2 replicates per group [4 are required], raw data not submitted, and high variability in chemical concentrations of lowest test groups)
72-4(b)	850.1300 850.1350	Aquatic Invertebrate Life-Cycle	Daphnid 422451-14	Supplemental (daphnid weight not measured)
72-5	850.1500	Freshwater Fish Full Life-Cycle		reserved
122-1(a)	850.4100	Seed Germ./Seedling Emergence (Tier I)		reserved
122-1(b)	850.4150	Vegetative Vigor (Tier I)		reserved
122-2	850.440	Aquatic Plant Growth (Tier I)		reserved
123-1(a)	850.4225	Seed Germ./Seedling Emergence (Tier II)		reserved
123-1(b)	850.4250	Vegetative Vigor (Tier II)		reserved
123-2	850.4400	Aquatic Plant Growth (Tier II)		reserved
141-1	850.3020	Honey Bee Acute Contact LD_{50}	Honey bee 422451-23	Invalid (six bees escaped from one test group)
			Honey bee 422451-24	Core
141-2	850.3030	Honey Bee Residue on Foliage		reserved

APPENDIX B: Environmental fate data for difenoconazole

1. Degradation

Hydrolysis: 161-1 (Satisfied)
Study MRID 42245127
Atkins, R.H. 1991. Hydrolysis of [^{14}C]CGA-169374 at pH 5, 7, and 9. PTRL Project No. 494. Unpublished study performed by PTRL, East Inc., Richmond, KY and submitted by Ciba-Geigy, Greensboro, NC.

[^{14}C]Triazole ring-labeled difenoconazole did not hydrolyze in pH 5, 7, and 9 aqueous buffers when incubated at 25 C for 30 days. The parent compound comprised 95.2-109.0% of the initial radioactivity throughout the study (Table V). There were two unknown compounds designated A and B which comprised maximums of 1.2 and 1.1% of the initial radioactivity, respectively; the unknowns were not consistently recovered from all samples at every sampling interval. Material balances ranged from 94.9 to 114.2% of the initial radioactivity at all pH levels at each sampling interval.

Aqueous Photolysis: 161-2
Study MRID 42245128 (Supplemental)
Spare, W. C. 1991. Aqueous photolysis of ^{14}C-CGA-169374. Agrisearch Project No: 12195. Unpublished study performed by Agrisearch Incorporated, Frederick, MD; and submitted by CIBA-GEIGY Corporation, Greensboro, NC.

Triazole ring-labeled [3,5-^{14}C]difenoconazole, at a nominal concentration of 1 ppm (actual concentration of 0.86 ppm), degraded with of 6 days ($r^2 = 0.97$) in sterilized pH 7 aqueous buffer solution which was irradiated with a xenon arc lamp (12 hour light/dark cycle) and maintained at 25 ± 1°C for up to 30 days. The parent compound was relatively stable in the pH 7 dark control solutions. In the irradiated solutions, the parent compound was initially 98.3% of the applied radioactivity, decreased to 55.4% by 5 days, was 15.8-16.4% from 9 to 15 days posttreatment, and was 2.3% at 30 days. The major degradate CGA-71019 was initially (day 5) 9.2% of the applied radioactivity, was a maximum of 12.9% at 9 days posttreatment, and was 8.6-11.2% from 15 to 30 days. An unidentified major degradate (Unknown 2) was 4.0-5.6% of the applied radioactivity from 1 to 3 days posttreatment, was a maximum of 19.1% at 9 days, and was 3.9-6.1% from 22 to 30 days. An unidentified major degradate (Unknown 1) was initially (day 2) 6.6% of the applied radioactivity, was a maximum of 14.0% at 5 days posttreatment, and was 0.3% at 30 days. The minor degradates CGA-205375 and CGA-205374 were present at ≤2.9% and ≤1.5% of the applied radioactivity, respectively, throughout the incubation period. Uncharacterized polar radioactivity was initially (day 2) 0.5% (one sample) of the applied radioactivity, increased to 13.5% by 5 days posttreatment, was 48.3% at 9 days, and was a maximum of 84.6% at 30 days. In the dark control solutions, the parent compound was present at 99.7-104.8% of the applied radioactivity from 0 to 22 days posttreatment, and decreased to 88.4% by 30 days. The minor degradate CGA-205374 was detected once, at 1.4% of the applied radioactivity at 5 days posttreatment.

Photodegradation on soil (161-3)
A new study is required

2. Metabolism

Aerobic and Anaerobic Soil Metabolism 162-1,162-2
Study MRID 42245131 (Supplemental)
Gonzalez-Valero, J. 1991. (Interim Report) Rate of degradation of ^{14}C-CGA-169374 in aerobic soil at various conditions. Laboratory Project IDs: 91GJ01 and 91GJ02. Unpublished study performed by CIBA-GEIGY Limited, Basel, SWITZERLAND; and submitted by CIBA-GEIGY Corp., Greensboro, NC.

The study indicated that difenoconazole is moderately persistent in soil under aerobic conditions when applied at 0.1 mg ai/kg-soil. The registrant calculated a half-life (reported as a DT_{50}) of 79 days, and the study reviewer calculated a half-life of 85 days. The material balance was outside the reasonable range of 90-110% in this study. The material balance (based on LSC analysis) decreased over time and was 120.5-123.2% of the applied radioactivity at 0-30 days posttreatment and were 95.9-102.7% of the applied at 60-120 days posttreatment. Also, the soil moisture content was maintained at 60% of 0.33 bar, where Subdivision N guidelines require that the soil moisture content be adjusted to 75% of 0.33 bar.

The high treatment rate study used an application rate of 10 mg ai/kg-soil (8 X the maximum label rate) and was terminated before the pattern of decline of the test substance was established.

Due to these major issues as well as other concerns detailed in the DER, the study was considered to be supplemental. Since the material balance for the low application rate (0.1 mg ai/kg-soil) is beyond the acceptable range of 90-110 %, this study should not be used to estimate an aerobic soil metabolism half-life for modeling. Therefore, the compound is assumed to be stable to aerobic soil metabolism.

Study MRID 42245132 (Supplemental)
Spare, W. C. 1987. Soil metabolism of CGA-169374 under aerobic, aerobic/anaerobic and sterile conditions. Laboratory Project No.: 1239. Unpublished study performed by Agrisearch Incorporated, Frederick, MD; and submitted by CIBA-GEIGY Corporation, Greensboro, NC.

The parent compound was relatively stable in both aerobic and anaerobic loam soil. The registrant-calculated half-lives for the parent in aerobic and anaerobic loam soil systems were 1600 days and 947 days, respectively.

In the aerobic soil metabolism study, radiolabeled difenoconozole, at a nominal application rate of 10 ppm, was relatively stable in aerobic loam soil that was incubated in darkness at 25 ± 1°C for up to 12 months. However, data were variable over time. Data reported percentages of the applied radioactivity represent percentages of the nominal application. Concentration data (in ppm) were reviewer-calculated based on the percentage of the applied radioactivity and the nominal application rate. The parent compound was initially present in the soil at 91.4% (9.1 ppm) of the applied radioactivity and was variable at 62.0-99.7% (6.2-10.0 ppm) at 1-365 days posttreatment. No major degradates were detected; one unidentified minor degradate was detected. Nonextractable [^{14}C]residues were initially (time 0) 2.3% (0.23 ppm) of the applied radioactivity, increased to 18.7% (1.9 ppm) by 3 months, and were 15.5% (1.6 ppm) at 12 months posttreatment (reviewer-calculated means). Evolved $^{14}CO_2$ and [^{14}C]organic volatiles were not detected.

In the anaerobic soil metabolism study, radiolabeled difenoconozole, at a nominal application rate of 10 ppm, was stable in flooded loam soil that was incubated anaerobically (nitrogen) in darkness at 25 ± 1°C for up to 61 days following a 30-day aerobic incubation period. However, data were variable throughout the 30-day aerobic incubation, and only two samples were taken after anaerobic conditions were induced. Data reported as percentages of the applied radioactivity represent percentages of the nominal application. Data were not reported in units of concentration. Time 0 data were determined prior to flooding (following 30 days of aerobic incubation). Sampling intervals are reported as days following the initiation of the anaerobic phase of the study. Total system data were not reported. The parent compound was initially present in the soil phase at 87.1% of the applied radioactivity and was 83.2-83.3% at 28-61 days. No major degradates were detected; one unidentified minor degradate was detected. Nonextractable [^{14}C]residues were initially (time 0) 8.9% of the applied radioactivity and were 21.0-21.6% at 28-61 days following the initiation of anaerobic conditions (reviewer-calculated mean). Evolved $^{14}CO_2$ and [^{14}C]organic volatiles were not measured. [^{14}C]Residues in the water phase (≤2.1% of the applied radioactivity) were not characterized.

Study MRID 42245133 (Supplemental)
Spare, W. C. 1992. Soil metabolism of CGA-169374 under aerobic, aerobic/anaerobic, and sterile conditions. Agrisearch Project No.: 1294. Unpublished study performed by Agrisearch Incorporated, Frederick, MD; and submitted by CIBA-GEIGY Corporation, Greensboro, NC.

Triazole ring-labeled [3,5-^{14}C]difenoconozole, at a nominal application rate of 10 ppm, was relatively stable (registrant-calculated half-life of 1059 days; $r^2 = 0.69$) in aerobic sandy loam soil that was incubated in darkness at 23.5-26.0°C for up to 365 days.

In the aerobic soil metabolism study, triazole ring-labeled [3,5-^{14}C]difenoconozole, at a nominal application rate of 10 ppm, was relatively stable (registrant-calculated half-life of 1059 days; $r^2 = 0.69$) in aerobic sandy loam soil that was incubated in darkness at 23.5-26.0°C for up to 365 days. All data, reported as percentages of the applied radioactivity, represent percentages of the nominal application. Data are reviewer-calculated means of two replicates, each of which were analyzed by two different TLC systems (unless otherwise noted). Concentration data (in ppm) were reviewer-calculated based on the percentage of the applied radioactivity and the nominal application rate. The parent compound was initially 95.6% (9.6 ppm) of the applied radioactivity, was 82.2-83.0% (8.2-8.3 ppm) at 14-91days, and was 69.1% (6.9 ppm) at 365 days posttreatment. The minor degradate CGA-205374 (chemical name not reported) was initially (time 0) 0.9% (0.09 ppm) of the applied radioactivity and was 3.6% (0.36 ppm) at 365 days posttreatment (detected by only one TLC system). The minor degradate CGA 205375 was initially (time 0) 0.73% (0.073 ppm) of the applied radioactivity, was a maximum of 2.7% (0.27 ppm) at 181 days, and was 2.0% (0.2 ppm) at 365 days posttreatment. Nonextractable [^{14}C]residues were initially (time 0) 1.6% (0.16 ppm) of the applied radioactivity, increased to 6.0% (0.6 ppm) by 30 days and a maximum of 8.7% (0.87 ppm) by 181 days, and were 5.5% (0.55 ppm) at 272-365 days posttreatment. Total [^{14}C]volatiles were ≤0.9% (0.09 ppm) of the applied radioactivity throughout the incubation period.

In aerobic sterile control samples, triazole ring-labeled [3,5-^{14}C]difenoconozole, at a nominal application rate of 10 ppm, was relatively stable in sterile, aerobic sandy loam soil that was incubated in darkness at 23.5-26.0°C for up to 181 days. All data, reported as percentages of the applied radioactivity, represent percentages of the nominal application Data are reviewer-calculated means of two replicates, each of which were analyzed by two different TLC systems. Concentration data (in ppm) were reviewer-calculated based on the percentage of the applied radioactivity and the nominal application rate. The parent compound was initially 95.6% (9.6 ppm) of the applied radioactivity and was 88.7% (8.9 ppm) at 181 days posttreatment. The minor degradate CGA-205374 was present at 0.35-0.95% (0.035-0.1 ppm) of the applied radioactivity at 30-181 days posttreatment (detected by only one TLC system). The minor degradate CGA-205375 was present at 0.60-1.7% (0.060-0.71 ppm) of the applied radioactivity at 30-181 days posttreatment. Nonextractable [^{14}C]residues were 2.1-3.8% (0.21-0.38 ppm) of the applied radioactivity at 30-181 days posttreatment. Total [^{14}C]volatiles were ≤0.1% (0.01 ppm) of the applied radioactivity.

In the anaerobic soil metabolism study, triazole ring-labeled [3,5-^{14}C]difenoconozole, at a nominal application rate of 10 ppm, was relatively stable in flooded sandy loam soil that was incubated anaerobically (nitrogen) in darkness at 23.5-26.0°C for up to 61 days following a 30-day aerobic incubation period. All data, reported as percentages of the applied radioactivity, represent percentages of the nominal application Data are reviewer-calculated means of two replicates, each of which were analyzed by two different TLC systems. Data were not reported in units of concentration. Time-0 data were determined prior to flooding (following 30 days of aerobic incubation). Sampling intervals are reported as days following the initiation of the anaerobic phase of the study. In the total soil/water system, the parent compound was initially present at 82.6% of the applied radioactivity and was 75.7-79.7% at 29-61 days following the initiation of anaerobic conditions. In the soil phase, the parent compound was initially present at 82.6% of the applied radioactivity and was 73.1-77.2% at 29-61 days. The minor degradate CGA-205374 was initially (time 0) 1.9% of the applied radioactivity and was 3.6% at 61 days following the initiation of anaerobic conditions (detected by only one TLC system). The minor degradate CGA-205375 was initially (time 0) 1.1% of the applied radioactivity (three of four replicates) and increased to 2.5% by 61 days following the initiation of anaerobic conditions. Nonextractable [^{14}C]residues were initially (time 0) 6.0% of the applied radioactivity, were 6.2% at 29 days, and were 4.3% at 61 days following the initiation of anaerobic conditions. In the water phase, the parent compound was present at 2.5-2.7% of the applied radioactivity at 29-61 days following the initiation of anaerobic conditions. The minor degradate CGA-205374 was 0.7-0.9% of the applied radioactivity at 29-61 days following the initiation of anaerobic conditions (detected by only one TLC system). The minor degradate CGA-205375 was 0.45-1.1% of the applied radioactivity at 29-61 days following the initiation of anaerobic conditions. [^{14}C]Volatiles were not measured.

Anaerobic aquatic metabolism (162-3)
Study MRID 42245134 (Supplemental)
Spare, W. 1989. Aerobic and anaerobic aquatic metabolism of CGA-169374. Agrisearch Project No: 1240. Unpublished study performed by Agrisearch Inc. Fredrick, MD; and submitted by Agricultural Division, CIBA-GEIGY Corp., Greensboro, NC.

Under anaerobic conditions, triazole ring labeled [3,5-^{14}C] difenoconazole, at a nominal concentration of 10.0 μg/mL (reviewer calculated), was relatively stable (registrant- calculated half-life was 1245 days; $r^2 = 0.62$) in flooded loam sediment that was incubated in darkness at 25 $\pm$ 1 °C for up to 365 days; however, data were variable between sampling intervals. The parent compound was present at 78.0% of the applied radioactivity at 365 days posttreatment. All reported data are the means of two replicates which were both analyzed by two separate TLC systems, unless otherwise reported. In the total sediment/water system, the parent compound was initially 95.6% (single replicates) of the applied radioactivity, decreased with variability to 83.3% by 7 days posttreatment, was 96.4% at 91 days, and decreased with variability to 78.0% by 365 days. In the water phase, the parent compound was initially 95.6% (single replicate; prior to flooding of the sediment) of the applied radioactivity and was 8.7% at 1 day posttreatment (reviewer-calculated), the last sampling interval for which the water phase of the applied radioactivity [^{14}C] residues were characterized. In the sediment phase, the parent compound was 82.4% of the applied radioactivity at 1 day posttreatment, was 95.4% at 3 days, 83.3% at 7 days, and 96.4% at 91days and decreased with variability to78.0% by 365 days. Non extractable [^{14}C] residues were$\leq$ 8.1%(reviewer-calculated) of the applied radioactivity throughout the incubation period. [^{14}C] Volatiles were not detected during the incubation period; tabular data were not presented. The distribution ratio (reviewer-calculated) of [^{14}C] between sediment and water phases was 9.4:1 at 1 day posttreatment, 26.5:1 at 3 days, and 52.9:1 (single replicate) at 365 days.

Aerobic Aquatic metabolism (162-4)
Study MRID 42245134 (Supplemental)
Spare, W. 1989. Aerobic and anaerobic aquatic metabolism of CGA-169374. Agrisearch Project No: 1240. Unpublished study performed by Agrisearch Inc. Fredrick, MD; and submitted by Agricultural Division, CIBA-GEIGY Corp., Greensboro, NC.

Under aerobic conditions, triazole ring labeled [3,5-^{14}C] difenoconazole, at a nominal concentration of 10.0 μg/mL (reviewer calculated), was relatively stable (registrant- calculated half-life was 860 days; $r^2 = 0.03$) in flooded loam sediment that was incubated in darkness at 25 $\pm$ 1 °C for up to 30 days; however, data were variable between sampling intervals. The parent compound was present at 86.8% of the applied radioactivity at 30 days posttreatment. All reported data are the means of two replicates which were both analyzed by two separate TLC systems, unless otherwise reported. In the total sediment/water system, the parent compound was initially 95.6% (single replicates) of the applied radioactivity, decreased to 80.5% by 1 day posttreatment, was 116.4% at 7 days, and decreased with variability to 86.8% by 30 days. In the water phase, the parent compound was initially 95.6% (single replicate; prior to flooding of the sediment) of the applied radioactivity and was 7.9% (reviewer calculated) at 1 day posttreatment, the last sampling interval for which the water phase [^{14}C] residues were characterized. In the sediment phase, the parent compound was 72.6% (reviewer-calculated) of the applied radioactivity at 1 day posttreatment, was 116.4% at 7 days, 83.3% at 7 days, and decreased with variability to 86.8% by 30 days. Non extractable [^{14}C] residues were$\leq$ 6.4%(reviewer-calculated) of the applied radioactivity throughout the incubation period. [^{14}C] Volatiles were not detected during the incubation period; tabular data were not presented. The distribution ratio (reviewer-calculated) of [^{14}C] between sediment and water phases was 7.9:1 at 1 day posttreatment, and 40.0:1 at 30 days.

3. Mobility

<u>Leaching and Adsorption Desorption Studies 163-1</u>

Study MRID 42245135 (Supplemental)
Atkins, R. H. 1991. Soil adsorption/desorption of [^{14}C]CGA-169374 by the batch equilibrium method. PTRL Project No.: 495. CIBA-GEIGY Study No.: 114-90. Unpublished study performed by PTRL East, Inc., Richmond, KY; and submitted by CIBA-GEIGY Corporation, Greensboro, NC.

Triazole ring-labeled [3,5-^{14}C]difenoconazole (MRID 42245135), at nominal concentrations of 0.1, 0.2, 0.4, 0.7, and 1.0 ppm, was studied in sand, sandy loam, silt loam, and silty clay loam soil:solution slurries that were equilibrated for 24 hours in darkness at 25 ± 0.0°C. Freundlich K_{ads} values were 12.8 for the sand soil (0.62% o.m.), 63.0 for the sandy loam soil (3.4% o.m.), 54.8 for the silt loam soil, and 47.2 for the silty clay loam soil; corresponding K_{oc} values were 3867, 3518, 3471, and 7734 mL/g. Respective 1/N values (reviewer-calculated) were 0.74, 0.76, 0.85, and 0.91 for adsorption. Freundlich K_{des} values determined following a 24-hour equilibration period were 18.6 for the sand soil, 95.2 for the sandy loam soil, 57.2 for the silt loam soil, and 71.4 for the silty clay loam soil; corresponding K_{oc} values were 5624, 5320, 3620, and 11700 mL/g. Respective 1/N values (reviewer-calculated) were 0.75, 0.80, 0.76, and 0.93 for desorption. The reviewer-calculated coefficients of determination (r^2) for the relationships K_{ads} *vs.* organic matter, K_{ads} *vs.* pH, and K_{ads} *vs.* clay content were 0.74, 0.18, and 0.21, respectively.

Study MRID 42245136 (Supplemental)
Spare, W. C. 1988. Adsorption/desorption of ^{14}C-CGA-169374. Agrisearch Project No.: 12115. Unpublished study performed by Agrisearch Incorporated, Frederick, MD; and submitted by CIBA-GEIGY Corporation, Greensboro, NC.

Triazole ring-labeled [3,5-^{14}C]difenoconazole (MRID 42245136), at nominal concentrations of 0.02, 0.05, 0.1, 0.5 and 1.0 μg/mL, was studied in autoclave sterilized clay, sand, silt loam, and sandy loam soil:solution slurries that were equilibrated for 8 hours at 25 ± 1°C. Freundlich K_{ads} values were 97.9 for the clay soil (4.8% o.m.), 2.1 for the sand soil (0.9% o.m.), 35.0 for the silt loam soil, and 11.5 for the sandy loam soil; corresponding K_{oc} values were 3466, 400, 5663, and 1956 mL/g. Respective 1/N values (reviewer-calculated) were 0.89, 0.80, 0.88, and 0.94 for adsorption. Freundlich K_{des} values determined following a 8-hour equilibration period were 119.1 for the clay soil, 4.2 for the sand soil, 66.7 for the silt loam soil, and 17.3 for the sandy loam soil; corresponding K_{oc} values were 4217, 790, 10792, and 2939 mL/g. Respective 1/N values (reviewer-calculated) were 0.86, 0.85, 0.89, and 0.94 for desorption. The reviewer-calculated coefficients of determination (r^2) for the relationships K_{ads} *vs.* organic matter, K_{ads} *vs.* pH, and K_{ads} *vs.* clay content were 0.91, 0.36, and 0.93, respectively.

Laboratory Volatility from Soil (163-2)

Field Volatility (163-3) (Not Satisfied)

4. Dissipation

Terrestrial Field Dissipation Studies 164-1
Study MRID 42245140 (Supplemental)
Kimmel, E. C. 1992. Mobility and dissipation of [^{14}C-Phenyl]-CGA-169374 under actual field conditions. PTRL-West Project No.: 111W. Unpublished study performed by PTRL-West, Inc., Richmond, CA; and submitted by CIBA-GEIGY Corporation, Greensboro, NC.

Uniformly phenyl ring-labeled [^{14}C]difenoconazole (CGA-169374), applied at a nominal application rate of 51.8 g a.i./A (0.41 mg/lysimeter) to lysimeter-enclosed bareground plots of loamy sand soil in Reedley, California, dissipated with a registrant-calculated half-life of 252 days ($r^2 = 0.91$); however, the observed first half-life occurred between 93 and 182 days posttreatment. The half-life was determined from the parent detected in the 0- to 3-inch depth rather than the top 6 inches. Data are reported as percentages of the nominal application and are reviewer-calculated means of methanol:water plus oxalic acid:DMF extractions. Residue data were only reported for the 0- to 3-inch depth. The parent was initially 82.4% (0.1 ppm) of the applied radioactivity in the 0- to 3-inch depth, decreased to 49.7% (0.072 ppm) by 93 days posttreatment, and was 25.7% (0.03 ppm) at 363 days. Degradate data are reported in parent equivalents. The minor degradate CGA-190978 was a maximum of 1.3% (0.001 ppm; methanol:water extraction only) of the applied radioactivity at 61 days posttreatment and was 0.59% (0.001 ppm) at 363 days. The minor degradate CGA-189138 was a maximum of 2.7% (0.003 ppm) of the applied radioactivity at 61 days posttreatment and was 1.7% (0.002 ppm) at 363 days. The minor degradate CGA-205374 was a maximum of 3.3% (0.003 ppm; methanol:water extraction only) of the applied radioactivity at time 0 and was 1.2% (0.001 ppm) at 363 days. The minor degradate CGA-205375 was a maximum of 6.9% (0.009 ppm) of the applied radioactivity at 182 days posttreatment and was 6.6% (0.008 ppm) at 363 days. [^{14}C]Residues were not characterized below the 0- to 3-inch depth. In the 3- to 6-inch depth, total [^{14}C]residues were initially 0.56% (0.001 ppm) of the applied radioactivity at 7 days posttreatment, increased to a maximum of 5.1% (0.005 ppm) by 272 days, and were 2.5% (0.003 ppm) at 363 days. In the 6- to 9-inch depth, total [^{14}C]residues were ≤0.94% (0.001 ppm) of the applied radioactivity from 14 to 363 days posttreatment. In the 9- to 12-inch depth, total [^{14}C]residues were 0.26-0.47% (0.0003-0.0004 ppm) of the applied radioactivity from 182 to 363 days posttreatment. In the 12- to 18-inch depth, total [^{14}C]residues were 0.30-1.3% (0.0001-0.0006 ppm) of the applied radioactivity from 182 to 363 days posttreatment. Total [^{14}C]residues detected in the leachate were 0.36% of the applied radioactivity throughout the study period.

5. Accumulation

Laboratory Accumulation in Fish: 165-4 (Satisfied)
Study MRID 42245142
Fackler, P.H. 1991. Bioconcentration and elimination of [^{14}C]-residues by Bluegill (Lepomis macrochirus) exposed to CGA-169374. Laboratory Project ID #1781.0387.6139.140. Unpublished study performed by Springborn Laboratories Inc., Ciba-Geigy Corp., and Battelle and submitted by Ciba-Geigy, Greensboro, NC.

[^{14}C]Difenoconazole accumulated rapidly in edible and non-edible bluegill sunfish tissues with bioconcentration factors of 170x for edible tissues, 570x for nonedible tissues, and 330x for whole body. Depuration was also rapid with a depuration half-life of approximately 1 day and 96-98% clearance after 14 days of depuration. One main metabolite, CGA-205375, was recovered from both the edible and non-edible tissues and accounted for 51-64% of the applied radioactivity. There were up to 9 minor metabolites which were not identified.

There are potentially up to 9 unidentified degradates associated with fish tissues. In the edible tissues the residues ranged from 0.012 to 0.022 ppm and in the nonedible tissues the residues ranged from 0.014 to 0.74 ppm. Due to use pattern of difenoconazole as a seed treatment, the low amounts of accumulation in fish tissues, and the rapid depuration of difenoconazole, at this time EFED does not consider that these degradates will be of environmental concern. If degradates of difenoconazole are found to be of toxicological concern, these fish tissue metabolites should be further investigated.

APPENDIX C: GENEEC 2.1 output for difenoconazole

RUN No. 1 FOR difenoconazole ON barley * INPUT VALUES *

RATE (#/AC) ONE(MULT)	No.APPS & INTERVAL	SOIL Koc	SOLUBIL (PPM)	APPL TYPE (%DRIFT)	NO-SPRAY (FT)	INCORP (IN)
.024(.024)	1 1	3471.0	15.0	GRANUL(.0)	.0	1.0

FIELD AND STANDARD POND HALFLIFE VALUES (DAYS)

METABOLIC (FIELD)	DAYS UNTIL RAIN/RUNOFF	HYDROLYSIS (POND)	PHOTOLYSIS (POND-EFF)	METABOLIC (POND)	COMBINED (POND)
.00	2	N/A	6.00- 744.00	.00	744.00

GENERIC EECs (IN NANOGRAMS/LITER (PPTr)) Version 2.0 Aug 1, 2001

PEAK GEEC	MAX 4 DAY AVG GEEC	MAX 21 DAY AVG GEEC	MAX 60 DAY AVG GEEC	MAX 90 DAY AVG GEEC
201.27	198.59	184.36	157.02	140.10

RUN No. 2 FOR difenoconazole ON cotton * INPUT VALUES *

RATE (#/AC) ONE(MULT)	No.APPS & INTERVAL	SOIL Koc	SOLUBIL (PPM)	APPL TYPE (%DRIFT)	NO-SPRAY (FT)	INCORP (IN)
.006(.006)	1 1	3471.0	15.0	GRANUL(.0)	.0	1.0

FIELD AND STANDARD POND HALFLIFE VALUES (DAYS)

METABOLIC (FIELD)	DAYS UNTIL RAIN/RUNOFF	HYDROLYSIS (POND)	PHOTOLYSIS (POND-EFF)	METABOLIC (POND)	COMBINED (POND)
.00	2	N/A	6.00- 744.00	.00	744.00

GENERIC EECs (IN NANOGRAMS/LITER (PPTr)) Version 2.0 Aug 1, 2001

PEAK GEEC	MAX 4 DAY AVG GEEC	MAX 21 DAY AVG GEEC	MAX 60 DAY AVG GEEC	MAX 90 DAY AVG GEEC
50.32	49.65	46.09	39.26	35.03

RUN No. 3 FOR difenoconazole ON sweet corn * INPUT VALUES *

RATE (#/AC) ONE(MULT)	No.APPS & INTERVAL	SOIL Koc	SOLUBIL (PPM)	APPL TYPE (%DRIFT)	NO-SPRAY (FT)	INCORP (IN)
.008(.008)	1 1	3471.0	15.0	GRANUL(.0)	.0	1.0

FIELD AND STANDARD POND HALFLIFE VALUES (DAYS)

METABOLIC (FIELD)	DAYS UNTIL RAIN/RUNOFF	HYDROLYSIS (POND)	PHOTOLYSIS (POND-EFF)	METABOLIC (POND)	COMBINED (POND)
.00	2	N/A	6.00- 744.00	.00	744.00

GENERIC EECs (IN NANOGRAMS/LITER (PPTr)) Version 2.0 Aug 1, 2001

PEAK GEEC	MAX 4 DAY AVG GEEC	MAX 21 DAY AVG GEEC	MAX 60 DAY AVG GEEC	MAX 90 DAY AVG GEEC
67.09	66.20	61.45	52.34	46.70

APPENDIX D: Ecological Hazard Data

Table D-1: Acute Toxicity of Difenoconazole to Fish

Species	% A.I.	96-hr LC_{50}, mg/L (confidence interval)	NOAEC (mg/L)	Measured/nominal Flow-through /static	Toxicity Classification	MRID (study year)	Status
Freshwater Fish							
Bluegill sunfish	96.1	1.2 (0.9, 1.7)[a]	0.52	Mean measured, Static	moderately toxic	422451-09 (1986)	core
Rainbow trout	96	0.81 (0.63, 1.2)[b]	0.35	Initial measured, Static	highly toxic	422451-07 (1987)	core
Rainbow trout	96.1	1.06 (0.98, 1.14)	<0.58	mean measured, flow through	moderately toxic	422451-08 (1990)	core
Estuarine/Marine Fish							
Sheepshead minnow	96.1	0.819 (0, +∞)[c]	0.325	Initial measured, static	highly toxic	422451-12 (1988)	core
Sheepshead minnow	96	1.1 (0.86, 1.5)[a]	0.27	Mean-measured, Flow through	moderately toxic	429067-02 (1993)	core

[a] There were no partial mortalities in these studies.
[b] There was only one partial mortality in this study.
[c] Binomial method used for LC_{50}.

Table D-2: Acute Toxicity of Difenoconazole to Invertebrates							
Species	**% A.I.**	**Toxicity endpoint, mg/L (confidence interval)**	**NOAEC (mg/L)**	**Measured/ nominal Flow-through /static**	**Toxicity Classification**	**MRID (year of citation)**	**Status**
Freshwater Invertebrates							
Daphnid	96.1	48hr LC_{50} = 0.77 (0.60, 0.95)	< 0.52	Mean measured, static	highly toxic	422451-10 (1986)	core
Estuarine/Marine Invertebrates							
Mysid	95	96hr LC_{50} = 0.150 (0.125, 0.194)	0.048	Mean measured, flow through	highly toxic	422451-11 (1990)	core
Eastern oyster (shell deposition	95	96hr EC_{50} >0.300	0.210	Mean measured, flow through	highly toxic	422451-13 (1990)	core
Eastern oyster (shell deposition	96	96hr EC_{50} = 0.424 (333, 539)	0.180	Mean measured, flow through	highly toxic	429067-01 (1993)	core

Table D-3: Chronic (Early-life) Toxicity of Difenoconazole to Freshwater Fish							
Species	**% a.i.**	**NOAEC (µg/L)**	**LOAEC (µg/L)**	**Study Properties[a]**	**Most sensitive parameter**	**MRID (year of citation)**	**Status**
Fathead minnow	94.8	8.7	19	M, F-T	larval length at 30 days post-hatch	422541-15 (1990)	Supplemental (control contamination in two replicates and large relative standard deviation for fish weight in one control replicate)

[a] M=mean-measured chemical concentrations, N=nominal chemical concentrations; F-T=flow-through; S=static.

Table D-4: Chronic (Early-life) Toxicity of Difenoconazole to Freshwater Invertebrates

Species	% a.i.	NOAEC (µg/L)	LOAEC (µg/L)	Study Properties[a]	Most sensitive parameter	MRID (year of citation)	Status
Daphnid	96.1	5.6	13	M, F-T	number of young/adult/ reproduction day and adult length	422541-14 (1988)	Supplemental (daphnid weight not measured)

[a] M=mean-measured chemical concentrations, N=nominal chemical concentrations; F-T=flow-through; S=static.

Table D-5: Avian Acute Toxicity to Difenoconazole

Species	% A.I.	Toxicity Endpoint (95% confidence interval)	NOAEC/ NOAEL	Toxicity Classification	Toxicity symptoms	MRID	Status
Acute Single Oral Dose							
Mallard duck	96.1	LD50 >2150 mg/kg-bwt	NOAEL = 2150 mg/kg-bwt	practically non-toxic	no mortality or clinical signs of toxicity	422451-05 (1988)	core
Acute Dietary							
Mallard duck	96.1	LC50 >5000 mg/kg-diet	NOAEC = 625 mg/kg-diet	practically non-toxic	reduction in body weight gain and food consumption	422451-04 (1988)	core
Bobwhite quail[a]	95.2	LC50 = 4579 mg/kg-diet (2500,+∞)	NOAEC = 625 mg/kg-diet	slightly toxic	reduction in body weight gain and food consumption	422451-03 (1988)	core

[a] There was only one partial mortality in this study. Binomial method used for LC_{50}.

Table D-6: Chronic Toxicity of Difenoconazole to Birds						
Species	% a.i.	NOAEC (mg ai/kg-diet)	LOAEC (mg ai/kg-diet)	Effects	MRID (year of citation)	Status
Mallard duck	91.9	125	625	egg shell thinning	422451-06 (1990)	Supplemental. (Statistical analyses of adult body weight, adult food consumption, offspring body weight at hatch and at 14 days of age, and 14-day survival could not be verified, since the report did not provide these data on a per pen basis.)

Table D-6: Mammalian Acute Oral Toxicity to Difenoconazole					
Species	% a.i.	LD_{50} (mg/kg-bwt)	Toxicity Classification	MRID (year of citation)	Status[a]
Rat	technical	1453 mg/kg bw	slightly toxic	420900-06 (1987)	Acceptable

[a] Acceptable/non-acceptable classification is from HED reviews.

Table D-8: Mammalian Developmental and Chronic Toxicity to Difenoconazole						
Test Type	% a.i.	NOAEC (mg/kg-diet)	LOAEC (mg/kg-diet)	Effects	MRID (year of citation)	Status[a]
2-generation reproductive (rats)	technical	parental= 25 reproductive = 25	parental = 250 reproductive =250	decreased maternal body weight gain, decreased pup weights at day 21	420900-18 (1988)	Acceptable

[a] Acceptable/non-acceptable classification is from HED reviews.

Table D-9: Acute Toxicity of Difenoconazole to Non-target Insects

Species	% a.i.	Toxicity endpoint	Toxicity classification	MRID (year of citation)	Status
Acute Contact					
Honey bee	91.1	$LD_{50} > 100\ \mu g$/bee	practically non-toxic	422451-24 (1989)	core

APPENDIX E: The Risk Quotient Method

The Risk Quotient Method is the means used by EFED to integrate the results of exposure and ecotoxicity data. For this method, risk quotients (RQs) are calculated by dividing exposure estimates by ecotoxicity values (i.e., RQ = EXPOSURE/TOXICITY), both acute and chronic. These RQs are then compared to OPP's levels of concern (LOCs). These LOCs are criteria used by OPP to indicate potential risk to non-target organisms and the need to consider regulatory action. EFED has defined LOCs for acute risk, potential restricted use classification, and for endangered species.

The criteria indicate that a pesticide used as directed has the potential to cause adverse effects on nontarget organisms. LOCs currently address the following risk presumption categories:

(1) acute - there is a potential for acute risk; regulatory action may be warranted in addition to restricted use classification;

(2) acute restricted use - the potential for acute risk is high, but this may be mitigated through restricted use classification

(3) acute endangered species - the potential for acute risk to endangered species is high, regulatory action may be warranted, and

(4) chronic risk - the potential for chronic risk is high, regulatory action may be warranted.

Currently, EFED does not perform assessments for chronic risk to plants, acute or chronic risks to non-target insects, or chronic risk from granular/bait formulations to mammalian or avian species.

The ecotoxicity test values (i.e., measurement endpoints) used in the acute and chronic risk quotients are derived from required studies. Examples of ecotoxicity values derived from short-term laboratory studies that assess acute effects are: (1) LC_{50} (fish and birds), (2) LD_{50} (birds and mammals), (3) EC_{50} (aquatic plants and aquatic invertebrates), and (4) EC_{25} (terrestrial plants). Examples of toxicity test effect levels derived from the results of long-term laboratory studies that assess chronic effects are: (1) LOAEL (birds, fish, and aquatic invertebrates), and (2) NOAEL (birds, fish and aquatic invertebrates). The NOAEL is generally used as the ecotoxicity test value in assessing chronic effects.

Risk presumptions, along with the corresponding RQs and LOCs are summarized in Table F1.

Table E-1: Risk Presumptions and LOCs		
Risk Presumption	**RQ**	**LOC**
Birds[1]		
Acute Risk	EEC/LC_{50} or LD_{50}/sqft or LD_{50}/day	0.5
Acute Restricted Use	EEC/LC_{50} or LD_{50}/sqft or LD_{50}/day (or $LD_{50} < 50$ mg/kg)	0.2
Acute Endangered Species	EEC/LC_{50} or LD_{50}/sqft or LD_{50}/day	0.1
Chronic Risk	EEC/NOAEC	1
Wild Mammals[1]		
Acute Risk	EEC/LC_{50} or LD_{50}/sqft or LD_{50}/day	0.5
Acute Restricted Use	EEC/LC_{50} or LD_{50}/sqft or LD_{50}/day (or $LD_{50} < 50$ mg/kg)	0.2
Acute Endangered Species	EEC/LC_{50} or LD_{50}/sqft or LD_{50}/day	0.1
Chronic Risk	EEC/NOAEC	1
Aquatic Animals[2]		
Acute Risk	EEC/LC_{50} or EC_{50}	0.5
Acute Restricted Use	EEC/LC_{50} or EC_{50}	0.1
Acute Endangered Species	EEC/LC_{50} or EC_{50}	0.05
Chronic Risk	EEC/NOAEC	1
Terrestrial and Semi-Aquatic Plants		
Acute Risk	EEC/EC_{25}	1
Acute Endangered Species	EEC/EC_{05} or NOAEC	1
Aquatic Plants[2]		
Acute Risk	EEC/EC_{50}	1
Acute Endangered Species	EEC/EC_{05} or NOAEC	1

[1] LD_{50}/sqft = (mg/sqft) / (LD_{50} * wt. of animal)
LD_{50}/day = (mg of toxicant consumed/day) / (LD_{50} * wt. of animal)

[2] EEC = (mg/L or μg/L) in water

APPENDIX F: Detailed Risk Quotient Calculations

Table F-1: Aquatic Organism Risk Quotient Calculations							
Scenario	Acute Toxicity Threshold, LC_{50} or EC_{50} (µg ai/L)	Chronic Toxicity Threshold, NOAEC (µg ai/L)	Water Concentration (µg ai/L)			Acute RQ[a]	Chronic RQ[b]
			peak	21-day	60-day		
Barley							
Freshwater Fish	810	8.7	0.201		0.157	<0.01	0.02
Freshwater Invert.	770	5.6	0.201	0.184		<0.01	0.03
Estuarine Fish	819	8.8*	0.201		0.157	<0.01	0.02
Estuarine Invert.	150	1.1*	0.201	0.184		<0.01	0.17
Sweet corn							
Freshwater Fish	810	8.7	0.067		0.052	<0.01	<0.01
Freshwater Invert.	770	5.6	0.067	0.061		<0.01	<0.01
Estuarine Fish	819	8.8*	0.067		0.052	<0.01	<0.01
Estuarine Invert.	150	1.1*	0.067	0.061		<0.01	0.03
Cotton							
Freshwater Fish	810	8.7	0.050		0.039	<0.01	<0.01
Freshwater Invert.	770	5.6	0.050	0.046		<0.01	<0.01
Estuarine Fish	819	8.8*	0.050		0.039	<0.01	<0.01
Estuarine Invert.	150	1.1*	0.050	0.046		<0.01	0.04

* No study was provided for the chronic toxicity of difenoconazole to estuarine/marine fish or invertebrates. An estimated NOAEC value of 8.8 μg/L was derived for the estuarine/marine based on the assumption that the acute to chronic adult mortality NOAEC ratio for freshwater fish the same as estuarine/marine fish. An estimated NOAEC value of 1.1 μg/L was derived for the estuarine/marine invertebrate based on the assumption that the acute to chronic adult mortality NOAEC

ratio for freshwater is the same as estuarine/marine invertebrates.

[a] * indicates an exceedance of Endangered Species Level of Concern (LOC); RQ > 0.05.

** indicates an exceedance of Acute Restricted Use LOC; RQ > 0.10.

*** indicates an exceedance of Acute Risk LOC; RQ > 0.50.

[b] + indicates an exceedance of Chronic LOC.

Table F-2. TREXv1.1 output for seed treatment for difenoconazole.

Chemical:	Difenoconazole		
Name of seed treatment formulation:	Dividend Extreme		
Percent AI in formulation:	7.73		
Endpoints	Reported	Tested Body Weight (g)	Adjusted LD50
Avian LD50:	2150	2000	1078
Avian repro. NOAEC:	125		
Mammalian LD50:	1453	350	2584
Mammalian NOAEC:	25		

Crop	Maximum Seeding Rate (lbs seed/acre)	Reference	Application Rate (fl oz/cwt)	Application Rate (lbs. AI/cwt)
Barley	100		4	0.0241
Corn	25		5	0.0301
Cotton	18		5.8	0.0349

Crop	Maximum Application Rate (lbs ai/A)	Maximum Seed Application Rate (mg ai/kg seed)	Avian Nagy Dose (mg ai/day)	Mammalian Nagy Dose (mg ai/day)	Available AI (mg ai ft-2)
Barley	0.0241	241	61	35	0.25
Corn	0.0075	301	76	44	0.08
Cotton	0.0063	349	88	51	0.07

Group	Scaling factor F value
Avian	5.061777181
Mammalian	5.125113265

Crop	Risk Quotients†					
	Avian			Mammalian		
	Acute (# 1)	Acute (# 2)	Chronic	Acute (# 1)	Acute (# 2)	Chronic
Barley	0.06	0.01	1.92	0.01	0.00	9.62
Corn	0.07	0.00	2.41	0.02	0.00	12.03
Cotton	0.08	0.00	2.79	0.02	0.00	13.95

† Acute RQ #1 = mg ai day-1 / LD50
Acute RQ #2 = mg ai ft-2 /(LD50*bw)
Chronic RQ = mg kg-1 seed / NOEC

Note: A separate run for TREXv1.1 using Dividend XL RTA was not performed as the actual application rate for barley (0.024 lbs ai/acre) was the same as Dividend Extreme.

APPENDIX G: Results from LOCATESv2.9.7. Endangered species co-occurrences (county-based) for birds, mammals, reptiles, and amphibians with sweet corn, barley, and cotton

Species Listing by State

No species were excluded

Minimum of 1 Acre.

Barley for grain (acres), SWEET CORN, Cotton, all (acres)

Alabama (15) species affected		**Taxa**	**Critical Habitat**
SALAMANDER, FLATWOODS *(Ambystoma cingulatum)*	Threatened	Amphibian	No
SALAMANDER, RED HILLS *(Phaeognathus hubrichti)*	Threatened	Amphibian	No
EAGLE, BALD *(Haliaeetus leucocephalus)*	Threatened	Bird	No
PLOVER, PIPING *(Charadrius melodus)*	Endangered	Bird	Yes
STORK, WOOD *(Mycteria americana)*	Endangered	Bird	No
WOODPECKER, RED-COCKADED *(Picoides borealis)*	Endangered	Bird	No
BAT, GRAY *(Myotis grisescens)*	Endangered	Mammal	No
BAT, INDIANA *(Myotis sodalis)*	Endangered	Mammal	Yes
MOUSE, ALABAMA BEACH *(Peromyscus polionotus ammobates)*	Endangered	Mammal	Yes
MOUSE, PERDIDO KEY BEACH *(Peromyscus polionotus trissyllepsis)*	Endangered	Mammal	Yes
SNAKE, EASTERN INDIGO *(Drymarchon corais couperi)*	Threatened	Reptile	No
TORTOISE, GOPHER *(Gopherus polyphemus)*	Threatened	Reptile	No
TURTLE, ALABAMA RED-BELLIED *(Pseudemys alabamensis)*	Endangered	Reptile	No
TURTLE, FLATTENED MUSK *(Sternotherus depressus)*	Threatened	Reptile	No
TURTLE, LOGGERHEAD SEA *(Caretta caretta)*	Threatened	Reptile	No

Arizona (20) species affected		**Taxa**	Critical Habitat
FROG, CHIRICAHUA LEOPARD *(Rana chiricahuensis)*	Threatened	Amphibian	No
SALAMANDER, SONORA TIGER *(Ambystoma tigrinum stebbinsi)*	Endangered	Amphibian	No
BOBWHITE, MASKED *(Colinus virginianus ridgwayi)*	Endangered	Bird	No
EAGLE, BALD *(Haliaeetus leucocephalus)*	Threatened	Bird	No
FALCON, NORTHERN APLOMADO *(Falco femoralis septentrionalis)*	Endangered	Bird	No
FLYCATCHER, SOUTHWESTERN WILLOW *(Empidonax traillii extimus)*	Endangered	Bird	Yes
OWL, MEXICAN SPOTTED *(Strix occidentalis lucida)*	Threatened	Bird	Yes
PELICAN, BROWN *(Pelecanus occidentalis)*	Endangered	Bird	No
PYGMY-OWL, CACTUS FERRUGINOUS *(Glaucidium brasilianum cactorum)*	Endangered	Bird	Yes
RAIL, YUMA CLAPPER *(Rallus longirostris yumanensis)*	Endangered	Bird	No
BAT, LESSER (=SANBORN'S) LONG-NOSED *(Leptonycteris curasoae yerbabuenae)*	Endangered	Mammal	No
JAGUAR *(Panthera onca)*	Endangered	Mammal	No
Jaguarundi, Sinaloan *(Herpailurus (=Felis) yagouaroundi tolteca)*	Endangered	Mammal	No
OCELOT *(Leopardus (=Felis) pardalis)*	Endangered	Mammal	No
PRONGHORN, SONORAN *(Antilocapra americana sonoriensis)*	Endangered	Mammal	No
SQUIRREL, MOUNT GRAHAM RED *(Tamiasciurus hudsonicus grahamensis)*	Endangered	Mammal	Yes
VOLE, HUALAPAI MEXICAN *(Microtus mexicanus hualpaiensis)*	Endangered	Mammal	No
WOLF, GRAY *(Canis lupus)*	Threatened	Mammal	Yes

RATTLESNAKE, NEW MEXICAN RIDGE-NOSED *(Crotalus willardi obscurus)*	Threatened	Reptile	Yes
TORTOISE, DESERT *(Gopherus agassizii)*	Threatened	Reptile	No

Arkansas (6) species affected

		Taxa	Critical Habitat
EAGLE, BALD *(Haliaeetus leucocephalus)*	Threatened	Bird	No
TERN, INTERIOR (POPULATION) LEAST *(Sterna antillarum)*	Endangered	Bird	No
WOODPECKER, RED-COCKADED *(Picoides borealis)*	Endangered	Bird	No
BAT, GRAY *(Myotis grisescens)*	Endangered	Mammal	No
BAT, INDIANA *(Myotis sodalis)*	Endangered	Mammal	Yes
BAT, OZARK BIG-EARED *(Corynorhinus (=Plecotus) townsendii ingens)*	Endangered	Mammal	No

California (51) species affected

		Taxa	Critical Habitat
FROG, CALIFORNIA RED-LEGGED *(Rana aurora draytonii)*	Threatened	Amphibian	No
FROG, MOUNTAIN YELLOW-LEGGED *(Rana muscosa)*	Endangered	Amphibian	No
SALAMANDER, CALIFORNIA TIGER *(Ambystoma californiense)*	Endangered	Amphibian	No
SALAMANDER, DESERT SLENDER *(Batrachoseps aridus)*	Endangered	Amphibian	No
SALAMANDER, SANTA CRUZ LONG-TOED *(Ambystoma macrodactylum croceum)*	Endangered	Amphibian	No
TOAD, ARROYO SOUTHWESTERN *(Bufo californicus (=microscaphus))*	Endangered	Amphibian	Yes
CONDOR, CALIFORNIA *(Gymnogyps californianus)*	Endangered	Bird	Yes
EAGLE, BALD *(Haliaeetus leucocephalus)*	Threatened	Bird	No
FLYCATCHER, SOUTHWESTERN WILLOW *(Empidonax traillii extimus)*	Endangered	Bird	Yes

GNATCATCHER, COASTAL CALIFORNIA *(Polioptila californica californica)*	Threatened	Bird	Yes
MURRELET, MARBLED *(Brachyramphus marmoratus marmoratus)*	Threatened	Bird	Yes
OWL, NORTHERN SPOTTED *(Strix occidentalis caurina)*	Threatened	Bird	Yes
PELICAN, BROWN *(Pelecanus occidentalis)*	Endangered	Bird	No
PLOVER, WESTERN SNOWY *(Charadrius alexandrinus nivosus)*	Threatened	Bird	No
RAIL, CALIFORNIA CLAPPER *(Rallus longirostris obsoletus)*	Endangered	Bird	No
RAIL, LIGHT-FOOTED CLAPPER *(Rallus longirostris levipes)*	Endangered	Bird	No
RAIL, YUMA CLAPPER *(Rallus longirostris yumanensis)*	Endangered	Bird	No
SHRIKE, SAN CLEMENTE LOGGERHEAD *(Lanius ludovicianus mearnsi)*	Endangered	Bird	No
SPARROW, SAN CLEMENTE SAGE *(Amphispiza belli clementeae)*	Threatened	Bird	No
TERN, CALIFORNIA LEAST *(Sterna antillarum browni)*	Endangered	Bird	No
VIREO, LEAST BELL'S *(Vireo bellii pusillus)*	Endangered	Bird	Yes
FOX, SAN JOAQUIN KIT *(Vulpes macrotis mutica)*	Endangered	Mammal	No
FOX, SAN MIGUEL ISLAND *(Urocyon littoralis littoralis)*	Endangered	Mammal	No
FOX, SANTA CATALINA ISLAND *(Urocyon littoralis catalinae)*	Endangered	Mammal	No
FOX, SANTA CRUZ ISLAND *(Urocyon littoralis santacruzae)*	Endangered	Mammal	No
FOX, SANTA ROSA ISLAND *(Urocyon littoralis santarosae)*	Endangered	Mammal	No
KANGAROO RAT, FRESNO *(Dipodomys nitratoides exilis)*	Endangered	Mammal	Yes
KANGAROO RAT, GIANT *(Dipodomys ingens)*	Endangered	Mammal	No

KANGAROO RAT, MORRO BAY *(Dipodomys heermanni morroensis)*	Endangered	Mammal	Yes
KANGAROO RAT, SAN BERNARDINO *(Dipodomys merriami parvus)*	Endangered	Mammal	Yes
KANGAROO RAT, STEPHENS' *(Dipodomys stephensi (incl. D. cascus))*	Threatened	Mammal	No
KANGAROO RAT, TIPTON *(Dipodomys nitratoides nitratoides)*	Endangered	Mammal	No
MOUNTAIN BEAVER, POINT ARENA *(Aplodontia rufa nigra)*	Endangered	Mammal	No
MOUSE, PACIFIC POCKET *(Perognathus longimembris pacificus)*	Endangered	Mammal	No
MOUSE, SALT MARSH HARVEST *(Reithrodontomys raviventris)*	Endangered	Mammal	No
OTTER, SOUTHERN SEA *(Enhydra lutris nereis)*	Threatened	Mammal	No
RABBIT, RIPARIAN BRUSH *(Sylvilagus bachmani riparius)*	Endangered	Mammal	No
SEAL, GUADALUPE FUR *(Arctocephalus townsendi)*	Threatened	Mammal	No
SHEEP, PENINSULAR BIGHORN *(Ovis canadensis)*	Threatened	Mammal	Yes
SHEEP, SIERRA NEVADA BIGHORN *(Ovis canadensis californiana)*	Endangered	Mammal	No
SHREW, BUENA VISTA *(Sorex ornatus relictus)*	Endangered	Mammal	Yes
VOLE, AMARGOSA *(Microtus californicus scirpensis)*	Endangered	Mammal	Yes
WOODRAT, RIPARIAN *(Neotoma fuscipes riparia)*	Endangered	Mammal	No
LIZARD, BLUNT-NOSED LEOPARD *(Gambelia silus)*	Endangered	Reptile	No
LIZARD, COACHELLA VALLEY FRINGE-TOED *(Uma inornata)*	Threatened	Reptile	Yes
LIZARD, ISLAND NIGHT *(Xantusia riversiana)*	Threatened	Reptile	No
SNAKE, GIANT GARTER *(Thamnophis gigas)*	Threatened	Reptile	No

SNAKE, SAN FRANCISCO GARTER *(Thamnophis sirtalis tetrataenia)*	Endangered	Reptile	No
TORTOISE, DESERT *(Gopherus agassizii)*	Threatened	Reptile	No
TURTLE, OLIVE (PACIFIC) RIDLEY SEA *(Lepidochelys olivacea)*	Endangered	Reptile	No
WHIPSNAKE (=striped racer), ALAMEDA *(Masticophis lateralis euryxanthus)*	Threatened	Reptile	Yes

Colorado (5) species affected

		Taxa	Critical Habitat
CRANE, WHOOPING *(Grus americana)*	Endangered	Bird	Yes
EAGLE, BALD *(Haliaeetus leucocephalus)*	Threatened	Bird	No
OWL, MEXICAN SPOTTED *(Strix occidentalis lucida)*	Threatened	Bird	Yes
FERRET, BLACK-FOOTED *(Mustela nigripes)*	Endangered	Mammal	No
MOUSE, PREBLE'S MEADOW JUMPING *(Zapus hudsonius preblei)*	Threatened	Mammal	Yes

Connecticut (4) species affected

		Taxa	Critical Habitat
EAGLE, BALD *(Haliaeetus leucocephalus)*	Threatened	Bird	No
PLOVER, PIPING *(Charadrius melodus)*	Endangered	Bird	Yes
TERN, ROSEATE *(Sterna dougallii dougallii)*	Endangered	Bird	No
BAT, INDIANA *(Myotis sodalis)*	Endangered	Mammal	Yes

Delaware (4) species affected

		Taxa	Critical Habitat
EAGLE, BALD *(Haliaeetus leucocephalus)*	Threatened	Bird	No
PLOVER, PIPING *(Charadrius melodus)*	Endangered	Bird	Yes
SQUIRREL, DELMARVA PENINSULA FOX *(Sciurus niger cinereus)*	Endangered	Mammal	No

WHALE, NORTHERN RIGHT *(Eubalaena glacialis)*	Endangered	Mammal	Yes

Florida (30) species affected

		Taxa	Critical Habitat
SALAMANDER, FLATWOODS *(Ambystoma cingulatum)*	Threatened	Amphibian	No
CARACARA, AUDUBON'S CRESTED *(Polyborus plancus audubonii)*	Threatened	Bird	No
EAGLE, BALD *(Haliaeetus leucocephalus)*	Threatened	Bird	No
JAY, FLORIDA SCRUB *(Aphelocoma coerulescens)*	Threatened	Bird	No
KITE, EVERGLADE SNAIL *(Rostrhamus sociabilis plumbeus)*	Endangered	Bird	Yes
PLOVER, PIPING *(Charadrius melodus)*	Endangered	Bird	Yes
SPARROW, CAPE SABLE SEASIDE *(Ammodramus maritimus mirabilis)*	Endangered	Bird	Yes
SPARROW, FLORIDA GRASSHOPPER *(Ammodramus savannarum floridanus)*	Endangered	Bird	No
STORK, WOOD *(Mycteria americana)*	Endangered	Bird	No
WOODPECKER, RED-COCKADED *(Picoides borealis)*	Endangered	Bird	No
BAT, GRAY *(Myotis grisescens)*	Endangered	Mammal	No
BAT, INDIANA *(Myotis sodalis)*	Endangered	Mammal	Yes
MANATEE, WEST INDIAN (FLORIDA) *(Trichechus manatus)*	Endangered	Mammal	Yes
MOUSE, ANASTASIA ISLAND BEACH *(Peromyscus polionotus phasma)*	Endangered	Mammal	No
MOUSE, CHOCTAWHATCHEE BEACH *(Peromyscus polionotus allophrys)*	Endangered	Mammal	Yes
MOUSE, PERDIDO KEY BEACH *(Peromyscus polionotus trissyllepsis)*	Endangered	Mammal	Yes
MOUSE, SOUTHEASTERN BEACH *(Peromyscus polionotus niveiventris)*	Threatened	Mammal	No

PANTHER, FLORIDA *(Puma (=Felis) concolor coryi)*	Endangered	Mammal	No
VOLE, FLORIDA SALT MARSH *(Microtus pennsylvanicus dukecampbelli)*	Endangered	Mammal	No
WHALE, NORTHERN RIGHT *(Eubalaena glacialis)*	Endangered	Mammal	Yes
CROCODILE, AMERICAN *(Crocodylus acutus)*	Endangered	Reptile	Yes
SKINK, BLUE-TAILED MOLE *(Eumeces egregius lividus)*	Threatened	Reptile	No
SKINK, SAND *(Neoseps reynoldsi)*	Threatened	Reptile	No
SNAKE, ATLANTIC SALT MARSH *(Nerodia clarkii taeniata)*	Threatened	Reptile	No
SNAKE, EASTERN INDIGO *(Drymarchon corais couperi)*	Threatened	Reptile	No
TURTLE, GREEN SEA *(Chelonia mydas)*	Endangered	Reptile	Yes
TURTLE, HAWKSBILL SEA *(Eretmochelys imbricata)*	Endangered	Reptile	Yes
TURTLE, KEMP'S (ATLANTIC) RIDLEY SEA *(Lepidochelys kempii)*	Endangered	Reptile	No
TURTLE, LEATHERBACK SEA *(Dermochelys coriacea)*	Endangered	Reptile	Yes
TURTLE, LOGGERHEAD SEA *(Caretta caretta)*	Threatened	Reptile	No

Georgia (12) species affected		**Taxa**	Critical Habitat
SALAMANDER, FLATWOODS *(Ambystoma cingulatum)*	Threatened	Amphibian	No
EAGLE, BALD *(Haliaeetus leucocephalus)*	Threatened	Bird	No
PLOVER, PIPING *(Charadrius melodus)*	Endangered	Bird	Yes
STORK, WOOD *(Mycteria americana)*	Endangered	Bird	No
WARBLER (WOOD), KIRTLAND'S *(Dendroica kirtlandii)*	Endangered	Bird	No

WOODPECKER, RED-COCKADED *(Picoides borealis)*	Endangered	Bird	No
BAT, GRAY *(Myotis grisescens)*	Endangered	Mammal	No
BAT, INDIANA *(Myotis sodalis)*	Endangered	Mammal	Yes
MANATEE, WEST INDIAN (FLORIDA) *(Trichechus manatus)*	Endangered	Mammal	Yes
WHALE, NORTHERN RIGHT *(Eubalaena glacialis)*	Endangered	Mammal	Yes
SNAKE, EASTERN INDIGO *(Drymarchon corais couperi)*	Threatened	Reptile	No
TURTLE, LOGGERHEAD SEA *(Caretta caretta)*	Threatened	Reptile	No

Hawaii (36) species affected		Taxa	Critical Habitat
'AKEPA, HAWAII *(Loxops coccineus coccineus)*	Endangered	Bird	No
'AKEPA, MAUI *(Loxops coccineus ochraceus)*	Endangered	Bird	No
'AKIA LOA, KAUAI (HEMIGNATHUS PROCERUS) *(Hemignathus procerus)*	Endangered	Bird	No
'AKIA POLA'AU (HEMIGNATHUS MUNROI) *(Hemignathus munroi)*	Endangered	Bird	No
ALBATROSS, SHORT-TAILED *(Phoebastria (=Diomedea) albatrus)*	Endangered	Bird	No
COOT, HAWAIIAN (=ALAE KEO KEO) *(Fulica americana alai)*	Endangered	Bird	No
CREEPER, HAWAII *(Oreomystis mana)*	Endangered	Bird	No
CREEPER, MOLOKAI (KAKAWAHIE) *(Paroreomyza flammea)*	Endangered	Bird	No
CREEPER, OAHU (ALAUWAHIO) *(Paroreomyza maculata)*	Endangered	Bird	No
CROW, HAWAIIAN ('ALALA) *(Corvus hawaiiensis)*	Endangered	Bird	No
DUCK, HAWAIIAN (KOLOA) *(Anas wyvilliana)*	Endangered	Bird	No

DUCK, LAYSAN *(Anas laysanensis)*	Endangered	Bird	No
ELEPAIO, OAHU *(Chasiempis sandwichensis ibidis)*	Endangered	Bird	Yes
FINCH, LAYSAN *(Telespyza cantans)*	Endangered	Bird	No
FINCH, NIHOA *(Telespyza ultima)*	Endangered	Bird	No
GOOSE, HAWAIIAN (NENE) *(Branta (=Nesochen) sandvicensis)*	Endangered	Bird	No
HAWK, HAWAIIAN (IO) *(Buteo solitarius)*	Endangered	Bird	No
HONEYCREEPER, CRESTED ('AKOHEKOHE) *(Palmeria dolei)*	Endangered	Bird	No
MILLERBIRD, NIHOA *(Acrocephalus familiaris kingi)*	Endangered	Bird	No
MOORHEN, HAWAIIAN COMMON *(Gallinula chloropus sandvicensis)*	Endangered	Bird	No
NUKU PU'U *(Hemignathus lucidus)*	Endangered	Bird	No
'O'O, KAUAI (='A'A) *(Moho braccatus)*	Endangered	Bird	No
'O'U (HONEYCREEPER) *(Psittirostra psittacea)*	Endangered	Bird	No
PALILA *(Loxioides bailleui)*	Endangered	Bird	Yes
PARROTBILL, MAUI *(Pseudonestor xanthophrys)*	Endangered	Bird	No
PETREL, HAWAIIAN DARK-RUMPED *(Pterodroma phaeopygia sandwichensis)*	Endangered	Bird	No
PO'OULI *(Melamprosops phaeosoma)*	Endangered	Bird	No
SHEARWATER, NEWELL'S TOWNSEND'S *(Puffinus auricularis newelli)*	Threatened	Bird	No
STILT, HAWAIIAN (=AE'O) *(Himantopus mexicanus knudseni)*	Endangered	Bird	No
THRUSH, LARGE KAUAI *(Myadestes myadestinus)*	Endangered	Bird	No

THRUSH, MOLOKAI (OLOMA'O) *(Myadestes lanaiensis rutha)*	Endangered	Bird	No
THRUSH, SMALL KAUAI (PUAIOHI) *(Myadestes palmeri)*	Endangered	Bird	No
BAT, HAWAIIAN HOARY *(Lasiurus cinereus semotus)*	Endangered	Mammal	No
SEAL, HAWAIIAN MONK *(Monachus schauinslandi)*	Endangered	Mammal	Yes
TURTLE, GREEN SEA *(Chelonia mydas)*	Endangered	Reptile	Yes
TURTLE, HAWKSBILL SEA *(Eretmochelys imbricata)*	Endangered	Reptile	Yes

Idaho (6) species affected

		Taxa	Critical Habitat
CRANE, WHOOPING *(Grus americana)*	Endangered	Bird	Yes
EAGLE, BALD *(Haliaeetus leucocephalus)*	Threatened	Bird	No
BEAR, GRIZZLY *(Ursus arctos horribilis)*	Threatened	Mammal	No
CARIBOU, WOODLAND *(Rangifer tarandus caribou)*	Endangered	Mammal	No
SQUIRREL, NORTHERN IDAHO GROUND *(Spermophilus brunneus brunneus)*	Threatened	Mammal	No
WOLF, GRAY *(Canis lupus)*	Threatened	Mammal	Yes

Illinois (5) species affected

		Taxa	Critical Habitat
EAGLE, BALD *(Haliaeetus leucocephalus)*	Threatened	Bird	No
PLOVER, PIPING *(Charadrius melodus)*	Endangered	Bird	Yes
TERN, INTERIOR (POPULATION) LEAST *(Sterna antillarum)*	Endangered	Bird	No
BAT, GRAY *(Myotis grisescens)*	Endangered	Mammal	No
BAT, INDIANA *(Myotis sodalis)*	Endangered	Mammal	Yes

Indiana (6) species affected

		Taxa	Critical Habitat
EAGLE, BALD *(Haliaeetus leucocephalus)*	Threatened	Bird	No
PLOVER, PIPING *(Charadrius melodus)*	Endangered	Bird	Yes
TERN, INTERIOR (POPULATION) LEAST *(Sterna antillarum)*	Endangered	Bird	No
BAT, GRAY *(Myotis grisescens)*	Endangered	Mammal	No
BAT, INDIANA *(Myotis sodalis)*	Endangered	Mammal	Yes
SNAKE, NORTHERN COPPERBELLY WATER *(Nerodia erythrogaster neglecta)*	Threatened	Reptile	No

Iowa (4) species affected

		Taxa	Critical Habitat
EAGLE, BALD *(Haliaeetus leucocephalus)*	Threatened	Bird	No
PLOVER, PIPING *(Charadrius melodus)*	Endangered	Bird	Yes
TERN, INTERIOR (POPULATION) LEAST *(Sterna antillarum)*	Endangered	Bird	No
BAT, INDIANA *(Myotis sodalis)*	Endangered	Mammal	Yes

Kansas (6) species affected

		Taxa	Critical Habitat
CRANE, WHOOPING *(Grus americana)*	Endangered	Bird	Yes
EAGLE, BALD *(Haliaeetus leucocephalus)*	Threatened	Bird	No
PLOVER, PIPING *(Charadrius melodus)*	Endangered	Bird	Yes
TERN, INTERIOR (POPULATION) LEAST *(Sterna antillarum)*	Endangered	Bird	No
BAT, GRAY *(Myotis grisescens)*	Endangered	Mammal	No
FERRET, BLACK-FOOTED *(Mustela nigripes)*	Endangered	Mammal	No

Kentucky (6) species affected

		Taxa	Critical Habitat

EAGLE, BALD *(Haliaeetus leucocephalus)*	Threatened	Bird	No
TERN, INTERIOR (POPULATION) LEAST *(Sterna antillarum)*	Endangered	Bird	No
WOODPECKER, RED-COCKADED *(Picoides borealis)*	Endangered	Bird	No
BAT, GRAY *(Myotis grisescens)*	Endangered	Mammal	No
BAT, INDIANA *(Myotis sodalis)*	Endangered	Mammal	Yes
BAT, VIRGINIA BIG-EARED *(Corynorhinus (=Plecotus) townsendii virginianus)*	Endangered	Mammal	Yes

Louisiana (10) species affected

		Taxa	Critical Habitat
EAGLE, BALD *(Haliaeetus leucocephalus)*	Threatened	Bird	No
PELICAN, BROWN *(Pelecanus occidentalis)*	Endangered	Bird	No
PLOVER, PIPING *(Charadrius melodus)*	Endangered	Bird	Yes
TERN, CALIFORNIA LEAST *(Sterna antillarum browni)*	Endangered	Bird	No
TERN, INTERIOR (POPULATION) LEAST *(Sterna antillarum)*	Endangered	Bird	No
WOODPECKER, RED-COCKADED *(Picoides borealis)*	Endangered	Bird	No
BEAR, AMERICAN BLACK *(Ursus americanus)*	Threatened	Mammal	No
BEAR, LOUISIANA BLACK *(Ursus americanus luteolus)*	Threatened	Mammal	Yes
TORTOISE, GOPHER *(Gopherus polyphemus)*	Threatened	Reptile	No
TURTLE, RINGED SAWBACK *(Graptemys oculifera)*	Threatened	Reptile	No

Maine (5) species affected

		Taxa	Critical Habitat
EAGLE, BALD *(Haliaeetus leucocephalus)*	Threatened	Bird	No

PLOVER, PIPING *(Charadrius melodus)*	Endangered	Bird	Yes
TERN, ROSEATE *(Sterna dougallii dougallii)*	Endangered	Bird	No
LYNX, CANADA *(Lynx canadensis)*	Threatened	Mammal	No
WHALE, NORTHERN RIGHT *(Eubalaena glacialis)*	Endangered	Mammal	Yes

Maryland (5) species affected		**Taxa**	Critical Habitat
EAGLE, BALD *(Haliaeetus leucocephalus)*	Threatened	Bird	No
PLOVER, PIPING *(Charadrius melodus)*	Endangered	Bird	Yes
BAT, INDIANA *(Myotis sodalis)*	Endangered	Mammal	Yes
SQUIRREL, DELMARVA PENINSULA FOX *(Sciurus niger cinereus)*	Endangered	Mammal	No
WHALE, NORTHERN RIGHT *(Eubalaena glacialis)*	Endangered	Mammal	Yes

Massachusetts (6) species affected		**Taxa**	Critical Habitat
EAGLE, BALD *(Haliaeetus leucocephalus)*	Threatened	Bird	No
PLOVER, PIPING *(Charadrius melodus)*	Endangered	Bird	Yes
TERN, ROSEATE *(Sterna dougallii dougallii)*	Endangered	Bird	No
BAT, INDIANA *(Myotis sodalis)*	Endangered	Mammal	Yes
WHALE, NORTHERN RIGHT *(Eubalaena glacialis)*	Endangered	Mammal	Yes
TURTLE, PLYMOUTH RED-BELLIED *(Pseudemys rubriventris bangsi)*	Endangered	Reptile	Yes

Michigan (6) species affected		**Taxa**	Critical Habitat
EAGLE, BALD *(Haliaeetus leucocephalus)*	Threatened	Bird	No

PLOVER, PIPING *(Charadrius melodus)*	Endangered	Bird	Yes
WARBLER (WOOD), KIRTLAND'S *(Dendroica kirtlandii)*	Endangered	Bird	No
BAT, INDIANA *(Myotis sodalis)*	Endangered	Mammal	Yes
WOLF, GRAY *(Canis lupus)*	Threatened	Mammal	Yes
SNAKE, NORTHERN COPPERBELLY WATER *(Nerodia erythrogaster neglecta)*	Threatened	Reptile	No

Minnesota (3) species affected		**Taxa**	Critical Habitat
EAGLE, BALD *(Haliaeetus leucocephalus)*	Threatened	Bird	No
PLOVER, PIPING *(Charadrius melodus)*	Endangered	Bird	Yes
WOLF, GRAY *(Canis lupus)*	Threatened	Mammal	Yes

Mississippi (13) species affected		**Taxa**	Critical Habitat
FROG, DUSKY GOPHER (MISSISSIPPI DPS) *(Rana capito sevosa)*	Endangered	Amphibian	No
CRANE, MISSISSIPPI SANDHILL *(Grus canadensis pulla)*	Endangered	Bird	Yes
EAGLE, BALD *(Haliaeetus leucocephalus)*	Threatened	Bird	No
PELICAN, BROWN *(Pelecanus occidentalis)*	Endangered	Bird	No
PLOVER, PIPING *(Charadrius melodus)*	Endangered	Bird	Yes
TERN, INTERIOR (POPULATION) LEAST *(Sterna antillarum)*	Endangered	Bird	No
WOODPECKER, RED-COCKADED *(Picoides borealis)*	Endangered	Bird	No
BEAR, LOUISIANA BLACK *(Ursus americanus luteolus)*	Threatened	Mammal	Yes
SNAKE, EASTERN INDIGO *(Drymarchon corais couperi)*	Threatened	Reptile	No

TORTOISE, GOPHER *(Gopherus polyphemus)*	Threatened	Reptile	No
TURTLE, LOGGERHEAD SEA *(Caretta caretta)*	Threatened	Reptile	No
TURTLE, RINGED SAWBACK *(Graptemys oculifera)*	Threatened	Reptile	No
TURTLE, YELLOW-BLOTCHED MAP *(Graptemys flavimaculata)*	Threatened	Reptile	No

Missouri (5) species affected		**Taxa**	Critical Habitat
EAGLE, BALD *(Haliaeetus leucocephalus)*	Threatened	Bird	No
PLOVER, PIPING *(Charadrius melodus)*	Endangered	Bird	Yes
TERN, INTERIOR (POPULATION) LEAST *(Sterna antillarum)*	Endangered	Bird	No
BAT, GRAY *(Myotis grisescens)*	Endangered	Mammal	No
BAT, INDIANA *(Myotis sodalis)*	Endangered	Mammal	Yes

Montana (7) species affected		**Taxa**	Critical Habitat
CRANE, WHOOPING *(Grus americana)*	Endangered	Bird	Yes
EAGLE, BALD *(Haliaeetus leucocephalus)*	Threatened	Bird	No
PLOVER, PIPING *(Charadrius melodus)*	Endangered	Bird	Yes
TERN, INTERIOR (POPULATION) LEAST *(Sterna antillarum)*	Endangered	Bird	No
BEAR, GRIZZLY *(Ursus arctos horribilis)*	Threatened	Mammal	No
FERRET, BLACK-FOOTED *(Mustela nigripes)*	Endangered	Mammal	No
WOLF, GRAY *(Canis lupus)*	Threatened	Mammal	Yes

Nebraska (5) species affected		**Taxa**	Critical Habitat

CRANE, WHOOPING *(Grus americana)*	Endangered	Bird	Yes
EAGLE, BALD *(Haliaeetus leucocephalus)*	Threatened	Bird	No
PLOVER, PIPING *(Charadrius melodus)*	Endangered	Bird	Yes
TERN, INTERIOR (POPULATION) LEAST *(Sterna antillarum)*	Endangered	Bird	No
FERRET, BLACK-FOOTED *(Mustela nigripes)*	Endangered	Mammal	No

Nevada (3) species affected		**Taxa**	Critical Habitat
EAGLE, BALD *(Haliaeetus leucocephalus)*	Threatened	Bird	No
RAIL, YUMA CLAPPER *(Rallus longirostris yumanensis)*	Endangered	Bird	No
TORTOISE, DESERT *(Gopherus agassizii)*	Threatened	Reptile	No

New Hampshire (2) species affected		**Taxa**	Critical Habitat
EAGLE, BALD *(Haliaeetus leucocephalus)*	Threatened	Bird	No
BAT, INDIANA *(Myotis sodalis)*	Endangered	Mammal	Yes

New Jersey (5) species affected		**Taxa**	Critical Habitat
CURLEW, ESKIMO *(Numenius borealis)*	Endangered	Bird	No
EAGLE, BALD *(Haliaeetus leucocephalus)*	Threatened	Bird	No
PLOVER, PIPING *(Charadrius melodus)*	Endangered	Bird	Yes
BAT, INDIANA *(Myotis sodalis)*	Endangered	Mammal	Yes
WHALE, NORTHERN RIGHT *(Eubalaena glacialis)*	Endangered	Mammal	Yes

New Mexico (13) species affected		**Taxa**	Critical Habitat
FROG, CHIRICAHUA LEOPARD *(Rana chiricahuensis)*	Threatened	Amphibian	No

CRANE, WHOOPING *(Grus americana)*	Endangered	Bird	Yes
EAGLE, BALD *(Haliaeetus leucocephalus)*	Threatened	Bird	No
FALCON, NORTHERN APLOMADO *(Falco femoralis septentrionalis)*	Endangered	Bird	No
FLYCATCHER, SOUTHWESTERN WILLOW *(Empidonax traillii extimus)*	Endangered	Bird	Yes
OWL, MEXICAN SPOTTED *(Strix occidentalis lucida)*	Threatened	Bird	Yes
TERN, INTERIOR (POPULATION) LEAST *(Sterna antillarum)*	Endangered	Bird	No
BAT, LESSER (=SANBORN'S) LONG-NOSED *(Leptonycteris curasoae yerbabuenae)*	Endangered	Mammal	No
BAT, MEXICAN LONG-NOSED *(Leptonycteris nivalis)*	Endangered	Mammal	No
FERRET, BLACK-FOOTED *(Mustela nigripes)*	Endangered	Mammal	No
JAGUAR *(Panthera onca)*	Endangered	Mammal	No
WOLF, GRAY *(Canis lupus)*	Threatened	Mammal	Yes
RATTLESNAKE, NEW MEXICAN RIDGE-NOSED *(Crotalus willardi obscurus)*	Threatened	Reptile	Yes

New York (5) species affected

		Taxa	Critical Habitat
EAGLE, BALD *(Haliaeetus leucocephalus)*	Threatened	Bird	No
PLOVER, PIPING *(Charadrius melodus)*	Endangered	Bird	Yes
TERN, ROSEATE *(Sterna dougallii dougallii)*	Endangered	Bird	No
BAT, INDIANA *(Myotis sodalis)*	Endangered	Mammal	Yes
WHALE, NORTHERN RIGHT *(Eubalaena glacialis)*	Endangered	Mammal	Yes

North Carolina (12) species affected

Taxa Critical Habitat

EAGLE, BALD *(Haliaeetus leucocephalus)*	Threatened	Bird	No
PLOVER, PIPING *(Charadrius melodus)*	Endangered	Bird	Yes
STORK, WOOD *(Mycteria americana)*	Endangered	Bird	No
TERN, ROSEATE *(Sterna dougallii dougallii)*	Endangered	Bird	No
WOODPECKER, RED-COCKADED *(Picoides borealis)*	Endangered	Bird	No
BAT, INDIANA *(Myotis sodalis)*	Endangered	Mammal	Yes
BAT, VIRGINIA BIG-EARED *(Corynorhinus (=Plecotus) townsendii virginianus)*	Endangered	Mammal	Yes
MANATEE, WEST INDIAN (FLORIDA) *(Trichechus manatus)*	Endangered	Mammal	Yes
SQUIRREL, CAROLINA NORTHERN FLYING *(Glaucomys sabrinus coloratus)*	Endangered	Mammal	No
WHALE, NORTHERN RIGHT *(Eubalaena glacialis)*	Endangered	Mammal	Yes
WOLF, RED *(Canis rufus)*	Endangered	Mammal	No
TURTLE, LOGGERHEAD SEA *(Caretta caretta)*	Threatened	Reptile	No

North Dakota (4) species affected		**Taxa**	Critical Habitat
CRANE, WHOOPING *(Grus americana)*	Endangered	Bird	Yes
EAGLE, BALD *(Haliaeetus leucocephalus)*	Threatened	Bird	No
PLOVER, PIPING *(Charadrius melodus)*	Endangered	Bird	Yes
TERN, INTERIOR (POPULATION) LEAST *(Sterna antillarum)*	Endangered	Bird	No

Ohio (5) species affected		**Taxa**	Critical Habitat
EAGLE, BALD *(Haliaeetus leucocephalus)*	Threatened	Bird	No

PLOVER, PIPING *(Charadrius melodus)*	Endangered	Bird	Yes
BAT, INDIANA *(Myotis sodalis)*	Endangered	Mammal	Yes
SNAKE, LAKE ERIE WATER *(Nerodia sipedon insularum)*	Threatened	Reptile	No
SNAKE, NORTHERN COPPERBELLY WATER *(Nerodia erythrogaster neglecta)*	Threatened	Reptile	No

Oklahoma (10) species affected

Species	Status	**Taxa**	Critical Habitat
CRANE, WHOOPING *(Grus americana)*	Endangered	Bird	Yes
CURLEW, ESKIMO *(Numenius borealis)*	Endangered	Bird	No
EAGLE, BALD *(Haliaeetus leucocephalus)*	Threatened	Bird	No
PLOVER, PIPING *(Charadrius melodus)*	Endangered	Bird	Yes
TERN, INTERIOR (POPULATION) LEAST *(Sterna antillarum)*	Endangered	Bird	No
VIREO, BLACK-CAPPED *(Vireo atricapilla)*	Endangered	Bird	No
WOODPECKER, RED-COCKADED *(Picoides borealis)*	Endangered	Bird	No
BAT, GRAY *(Myotis grisescens)*	Endangered	Mammal	No
BAT, INDIANA *(Myotis sodalis)*	Endangered	Mammal	Yes
BAT, OZARK BIG-EARED *(Corynorhinus (=Plecotus) townsendii ingens)*	Endangered	Mammal	No

Oregon (6) species affected

Species	Status	**Taxa**	Critical Habitat
EAGLE, BALD *(Haliaeetus leucocephalus)*	Threatened	Bird	No
MURRELET, MARBLED *(Brachyramphus marmoratus marmoratus)*	Threatened	Bird	Yes
OWL, NORTHERN SPOTTED *(Strix occidentalis caurina)*	Threatened	Bird	Yes

PELICAN, BROWN *(Pelecanus occidentalis)*	Endangered	Bird	No
PLOVER, WESTERN SNOWY *(Charadrius alexandrinus nivosus)*	Threatened	Bird	No
DEER, COLUMBIAN WHITE-TAILED *(Odocoileus virginianus leucurus)*	Endangered	Mammal	No

Pennsylvania (4) species affected

		Taxa	Critical Habitat
EAGLE, BALD *(Haliaeetus leucocephalus)*	Threatened	Bird	No
PLOVER, PIPING *(Charadrius melodus)*	Endangered	Bird	Yes
BAT, INDIANA *(Myotis sodalis)*	Endangered	Mammal	Yes
SQUIRREL, DELMARVA PENINSULA FOX *(Sciurus niger cinereus)*	Endangered	Mammal	No

Rhode Island (2) species affected

		Taxa	Critical Habitat
PLOVER, PIPING *(Charadrius melodus)*	Endangered	Bird	Yes
BAT, INDIANA *(Myotis sodalis)*	Endangered	Mammal	Yes

South Carolina (10) species affected

		Taxa	Critical Habitat
SALAMANDER, FLATWOODS *(Ambystoma cingulatum)*	Threatened	Amphibian	No
EAGLE, BALD *(Haliaeetus leucocephalus)*	Threatened	Bird	No
PLOVER, PIPING *(Charadrius melodus)*	Endangered	Bird	Yes
STORK, WOOD *(Mycteria americana)*	Endangered	Bird	No
WOODPECKER, RED-COCKADED *(Picoides borealis)*	Endangered	Bird	No
MANATEE, WEST INDIAN (FLORIDA) *(Trichechus manatus)*	Endangered	Mammal	Yes
WHALE, NORTHERN RIGHT *(Eubalaena glacialis)*	Endangered	Mammal	Yes

WOLF, RED *(Canis rufus)*	Endangered	Mammal	No
SNAKE, EASTERN INDIGO *(Drymarchon corais couperi)*	Threatened	Reptile	No
TURTLE, LOGGERHEAD SEA *(Caretta caretta)*	Threatened	Reptile	No

South Dakota (5) species affected

		Taxa	Critical Habitat
CRANE, WHOOPING *(Grus americana)*	Endangered	Bird	Yes
EAGLE, BALD *(Haliaeetus leucocephalus)*	Threatened	Bird	No
PLOVER, PIPING *(Charadrius melodus)*	Endangered	Bird	Yes
TERN, INTERIOR (POPULATION) LEAST *(Sterna antillarum)*	Endangered	Bird	No
FERRET, BLACK-FOOTED *(Mustela nigripes)*	Endangered	Mammal	No

Tennessee (7) species affected

		Taxa	Critical Habitat
EAGLE, BALD *(Haliaeetus leucocephalus)*	Threatened	Bird	No
TERN, INTERIOR (POPULATION) LEAST *(Sterna antillarum)*	Endangered	Bird	No
WOODPECKER, RED-COCKADED *(Picoides borealis)*	Endangered	Bird	No
BAT, GRAY *(Myotis grisescens)*	Endangered	Mammal	No
BAT, INDIANA *(Myotis sodalis)*	Endangered	Mammal	Yes
SQUIRREL, CAROLINA NORTHERN FLYING *(Glaucomys sabrinus coloratus)*	Endangered	Mammal	No
WOLF, RED *(Canis rufus)*	Endangered	Mammal	No

Texas (24) species affected

		Taxa	Critical Habitat
SALAMANDER, BARTON SPRINGS *(Eurycea sosorum)*	Endangered	Amphibian	No

SALAMANDER, SAN MARCOS *(Eurycea nana)*	Threatened	Amphibian	Yes
SALAMANDER, TEXAS BLIND *(Typhlomolge rathbuni)*	Endangered	Amphibian	No
TOAD, HOUSTON *(Bufo houstonensis)*	Endangered	Amphibian	Yes
CRANE, WHOOPING *(Grus americana)*	Endangered	Bird	Yes
CURLEW, ESKIMO *(Numenius borealis)*	Endangered	Bird	No
EAGLE, BALD *(Haliaeetus leucocephalus)*	Threatened	Bird	No
FALCON, NORTHERN APLOMADO *(Falco femoralis septentrionalis)*	Endangered	Bird	No
FLYCATCHER, SOUTHWESTERN WILLOW *(Empidonax traillii extimus)*	Endangered	Bird	Yes
PELICAN, BROWN *(Pelecanus occidentalis)*	Endangered	Bird	No
PLOVER, PIPING *(Charadrius melodus)*	Endangered	Bird	Yes
PRAIRIE-CHICKEN, ATTWATER'S GREATER *(Tympanuchus cupido attwateri)*	Endangered	Bird	No
TERN, INTERIOR (POPULATION) LEAST *(Sterna antillarum)*	Endangered	Bird	No
VIREO, BLACK-CAPPED *(Vireo atricapilla)*	Endangered	Bird	No
WARBLER (WOOD), GOLDEN-CHEEKED *(Dendroica chrysoparia)*	Endangered	Bird	No
WOODPECKER, RED-COCKADED *(Picoides borealis)*	Endangered	Bird	No
BAT, MEXICAN LONG-NOSED *(Leptonycteris nivalis)*	Endangered	Mammal	No
BEAR, LOUISIANA BLACK *(Ursus americanus luteolus)*	Threatened	Mammal	Yes
JAGUARUNDI, Gulf Coast *(Herpailurus (=Felis) yagouaroundi cacomitli)*	Endangered	Mammal	No
Jaguarundi, Sinaloan *(Herpailurus (=Felis) yagouaroundi tolteca)*	Endangered	Mammal	No

OCELOT *(Leopardus (=Felis) pardalis)*	Endangered	Mammal	No
SNAKE, CONCHO WATER *(Nerodia paucimaculata)*	Threatened	Reptile	Yes
TURTLE, KEMP'S (ATLANTIC) RIDLEY SEA *(Lepidochelys kempii)*	Endangered	Reptile	No
TURTLE, LOGGERHEAD SEA *(Caretta caretta)*	Threatened	Reptile	No

Utah (5) species affected		**Taxa**	Critical Habitat
EAGLE, BALD *(Haliaeetus leucocephalus)*	Threatened	Bird	No
OWL, MEXICAN SPOTTED *(Strix occidentalis lucida)*	Threatened	Bird	Yes
FERRET, BLACK-FOOTED *(Mustela nigripes)*	Endangered	Mammal	No
PRAIRIE DOG, UTAH *(Cynomys parvidens)*	Threatened	Mammal	No
TORTOISE, DESERT *(Gopherus agassizii)*	Threatened	Reptile	No

Vermont (2) species affected		**Taxa**	Critical Habitat
EAGLE, BALD *(Haliaeetus leucocephalus)*	Threatened	Bird	No
BAT, INDIANA *(Myotis sodalis)*	Endangered	Mammal	Yes

Virginia (11) species affected		**Taxa**	Critical Habitat
SALAMANDER, SHENANDOAH *(Plethodon shenandoah)*	Endangered	Amphibian	No
EAGLE, BALD *(Haliaeetus leucocephalus)*	Threatened	Bird	No
PLOVER, PIPING *(Charadrius melodus)*	Endangered	Bird	Yes
WOODPECKER, RED-COCKADED *(Picoides borealis)*	Endangered	Bird	No
BAT, GRAY *(Myotis grisescens)*	Endangered	Mammal	No

BAT, INDIANA *(Myotis sodalis)*	Endangered	Mammal	Yes
BAT, VIRGINIA BIG-EARED *(Corynorhinus (=Plecotus) townsendii virginianus)*	Endangered	Mammal	Yes
SQUIRREL, DELMARVA PENINSULA FOX *(Sciurus niger cinereus)*	Endangered	Mammal	No
SQUIRREL, VIRGINIA NORTHERN FLYING *(Glaucomys sabrinus fuscus)*	Endangered	Mammal	No
WHALE, NORTHERN RIGHT *(Eubalaena glacialis)*	Endangered	Mammal	Yes
TURTLE, LOGGERHEAD SEA *(Caretta caretta)*	Threatened	Reptile	No

Washington (10) species affected		**Taxa**	Critical Habitat
EAGLE, BALD *(Haliaeetus leucocephalus)*	Threatened	Bird	No
MURRELET, MARBLED *(Brachyramphus marmoratus marmoratus)*	Threatened	Bird	Yes
OWL, NORTHERN SPOTTED *(Strix occidentalis caurina)*	Threatened	Bird	Yes
PELICAN, BROWN *(Pelecanus occidentalis)*	Endangered	Bird	No
PLOVER, WESTERN SNOWY *(Charadrius alexandrinus nivosus)*	Threatened	Bird	No
BEAR, GRIZZLY *(Ursus arctos horribilis)*	Threatened	Mammal	No
CARIBOU, WOODLAND *(Rangifer tarandus caribou)*	Endangered	Mammal	No
DEER, COLUMBIAN WHITE-TAILED *(Odocoileus virginianus leucurus)*	Endangered	Mammal	No
RABBIT, PYGMY *(Brachylagus idahoensis)*	Endangered	Mammal	No
WOLF, GRAY *(Canis lupus)*	Threatened	Mammal	Yes

West Virginia (7) species affected		**Taxa**	Critical Habitat
SALAMANDER, CHEAT MOUNTAIN *(Plethodon nettingi)*	Threatened	Amphibian	No

EAGLE, BALD *(Haliaeetus leucocephalus)*	Threatened	Bird	No
BAT, GRAY *(Myotis grisescens)*	Endangered	Mammal	No
BAT, INDIANA *(Myotis sodalis)*	Endangered	Mammal	Yes
BAT, VIRGINIA BIG-EARED *(Corynorhinus (=Plecotus) townsendii virginianus)*	Endangered	Mammal	Yes
SQUIRREL, CAROLINA NORTHERN FLYING *(Glaucomys sabrinus coloratus)*	Endangered	Mammal	No
SQUIRREL, VIRGINIA NORTHERN FLYING *(Glaucomys sabrinus fuscus)*	Endangered	Mammal	No

Wisconsin (4) species affected

		Taxa	Critical Habitat
EAGLE, BALD *(Haliaeetus leucocephalus)*	Threatened	Bird	No
PLOVER, PIPING *(Charadrius melodus)*	Endangered	Bird	Yes
WARBLER (WOOD), KIRTLAND'S *(Dendroica kirtlandii)*	Endangered	Bird	No
WOLF, GRAY *(Canis lupus)*	Threatened	Mammal	Yes

Wyoming (6) species affected

		Taxa	Critical Habitat
TOAD, WYOMING *(Bufo baxteri (=hemiophrys))*	Endangered	Amphibian	No
EAGLE, BALD *(Haliaeetus leucocephalus)*	Threatened	Bird	No
BEAR, GRIZZLY *(Ursus arctos horribilis)*	Threatened	Mammal	No
FERRET, BLACK-FOOTED *(Mustela nigripes)*	Endangered	Mammal	No
MOUSE, PREBLE'S MEADOW JUMPING *(Zapus hudsonius preblei)*	Threatened	Mammal	Yes
WOLF, GRAY *(Canis lupus)*	Threatened	Mammal	Yes

No species were excluded.